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## CLINICAL STUDIES

OF

## Diseases of the Lungs

IN

## CHILDREN.

BY

**EUSTACE SMITH, M.D., LOND**

FELLOW OF THE ROYAL COLLEGE OF PHYSICIANS
PHYSICIAN TO HIS MAJESTY THE KING OF THE BELGIANS
PHYSICIAN TO THE EAST LONDON CHILDREN'S HOSPITAL,
SENIOR ASSISTANT PHYSICIAN TO THE VICTORIA PARK HOSPITAL FOR
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# CLINICAL STUDIES

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OF

# Diseases of the Lungs in Children.

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BY

EUSTACE SMITH, M. D., LOND.

W P Northrup

FELLOW OF THE ROYAL COLLEGE OF PHYSICIANS;
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## PREFACE.

The substance of the following pages has already appeared in the columns of the *Medical Times and Gazette.* In the republication new cases have been added, parts have been re-written, and the whole has been thoroughly revised.

The subject of Disease in Children is a large one, for although there are few disorders special to early life, yet the peculiarities of the childish constitution pervert and distort the ordinary phenomena of disease, so that even familiar complaints assume unfamiliar features, which may give rise to uncertainty or misapprehension.

The object of the writer has been to produce a practical work suitable as a guide to students and others engaged in the study of children's diseases.—With this view he has endeavored to illustrate the more important symptoms of each complaint by a selection of cases with commentaries interspersed through the text, in the hope that the introduction of the clinical element might relieve the formality of the systematic treatise, and at the same time present the subject in the most practical form before the reader.

The present volume comprises the principal diseases of the lungs. It had been the wish of the writer to produce a more complete work on the Diseases of Children, but the difficulty of finding cases sufficiently typical to furnish satisfactory illustration has at present prevented him from accomplishing this object.

The writer desires to express his obligations to his colleagues at the East London Children's Hospital for their kindness in placing their cases at his disposal, and also to the House Surgeons of the Hospital (past and present) for their valuable assistance in preparing many of the cases for publication.

GEORGE STREET, HANOVER SQUARE, *February* 1876.

## CHAPTER I.—INTRODUCTION.

Disease in early life often rendered obscure by the peculiarities of the childish constitution—Intense vital activity of organs and excitability of the nervous system—Wide diffusion of symptoms in cases of acute diseases—Intensity of symptoms no guide to their cause—Importance of local symptoms—But these sometimes misleading.

Frequency of functional derangements—Loss of normal nervous excitability under the influence of chronic disease.

Clinical examination of young children—Method of proceeding—Order of examination—Pulse—Temperature—Examination of chest.

General remarks on diagnosis, prognosis and treatment—Indications for treatment—Evils of too early stimulation—Drugs—Tolerance of children for certain drugs and susceptibility to others—Doses.

The diseases of infancy and childhood are often regarded as presenting peculiar difficulties; and certainly, to one accustomed only to disease as it presents itself in the adult subject, the symptoms will frequently appear obscure and sometimes contradictory. Children differ from adults in many ways. The intense nervous excitability in a robust child will often communicate a false appearance of gravity to a trivial ailment, while the lowered nervous sensibility which is found in a child much depressed by chronic disease will so obscure the symptoms that a serious intercurrent malady may excite little notice, or even be completely overlooked.

The diseases of children are in some respects simpler, in others more obscure, than those of elder persons. In the first place, children are less subject than adults to degenerations of tissue. They are not, however, exempt from such degenerations, for all the consequences of impaired nutrition may be found in the child, as in the adult; and not only may morbid products undergo a degenerative process, but also the normal tissues of the body may become the seat of structural changes such as in older persons are ascribed to the influence of advancing years. Thus, commencing atheroma of the aorta may be found in children of two or three years old; amyloid degenerations are far from uncommon in early life; and the degenerative processes occurring in pulmonary morbid deposits may be present in the youngest infants.

Still, as compared with the adult, degenerations are rare in the child; growth and development are in active progress, and the organs are gathering strength and maturing themselves for the efficient performance of their duties. The intense vital activity of organs, to which the child owes this comparative immunity, increases his susceptibility to disease by rendering him more liable to be affected by slight causes; it also renders the course of disease more rapid, the attack more sudden, and the symptoms more severe. Besides, the rapid development through which the whole nervous system is passing seems to link together the different organs into a closer sympathy, so that disease of one of these will often cause a general commotion throughout the body, and the most prominent symptoms may emanate from some distant organ, and not from the part which is the actual seat of trouble.

The access of acute disease in the young child is always accompanied by signs of general disturbance; and it is very important in the examination to distinguish between the general and the local symptoms—for the latter, although sometimes obscure, are yet much more exact than are those which arise from the general perturbation of the system. Thus, in the beginning of an attack of pneumonia, the cough, the rapid breathing, and the indications of pain in the side point pretty clearly to the lungs as the part attacked, while the high temperature, the vomiting, the headache, the rapid pulse, and in many cases the convulsions, are not special symptoms of chest disease, but are common to the beginning of many other febrile affections.

In entering upon the study of children's diseases it is very important to bear in mind this wide diffusion of symptoms, and also to remember that their severity bears no relation at all to the severity of the local disorder of which they are the manifestation. A mere functional disturbance will often, for the time, excite as wild a tumult in the system as the severest organic lesion; and we often find it necessary in diagnosis to wait for the general symptoms to diminish before we are able to gather from the local symptoms any sufficient tokens of the cause and nature of the ailment. Local symptoms, are not, however, always present. In infants, the weakness of the organism is so great, and the hold upon life so feeble, that death may take place before the more special symptoms have had time to reveal themselves; and thus a child thrown into violent convulsions by some trifling disorder may actually die from the shock to the system, and no post-mortem appearances may be afterwards found to account for the illness.

Even local symptoms themselves are not always to be trusted. The organ from which the more decided symptoms appear to arise may not be, as has been already stated, the organ in which the morbid process is actually seated, and these deceptive manifestations may throw the real lesion completely into the shade. Thus, in some cases of pneumonia the more prominent symptoms may be those of cerebral disturbance; violent convulsions, delirium, and stupor may so disguise the real nature of the complaint that the slight cough may be either unnoticed or unregarded, and active measures may be taken for the suppression of a supposed meningitis, to the neglect of the organ which is the real seat of disease.

Again, the local symptoms, although arising from the actual seat of trouble, may convey by themselves no trustworthy indication of the extent, or even the nature of the mischief. A child who went to bed healthy, except for a slight cold, wakes up suddenly after a few hours' sleep with fever, stridulous breathing, and a hoarse, barking cough. His breathing is very difficult, and sometimes becomes completely arrested, and we see the child with head thrown back, open mouth, and nostrils widely expanded, making ineffectual efforts to draw a breath, while his staring eyes, his frightened look, and the lividity of his face prove the reality of the impediment to the entrance of air

The spasm after a time relaxes, the symptoms subside, and the child fal
asleep. In the morning he may appear as well as on the eve of the attack,
may have a slight hoarseness and some cough, which subside after a few day
In this example the real morbid condition is merely catarrh of the larynge
mucous membrane, while all that is alarming in the symptoms is produc
by functional spasm from excentric irritation: it is an instance of the impo
tant part played by mere disorder of function in the diseases of childhoo
This frequency of mere functional derangements is another peculiarity
early life, which it is important to be aware of. On account of the extrem
impressionability of the nervous system in young children, and the delica
of their organs—especially their singular sensitiveness to changes of temper
ture—such disturbances form a large proportion of their ailments, and it is
the utmost importance for both prognosis and treatment that we should be ab
to form an accurate estimate of the real nature of such complaints. In this wa
gastric, intestinal and pulmonary catarrhs arise, and a violent attack
vomiting or diarrhœa will soon reduce an infant to a very dangerous state
weakness. Even in cases where the derangement is less acute and severe
may still be attended by actual danger to life. An infant is so dependent, n
only for growth and development, but for actual existence, upon a freque
supply of nourishment, that any derangement which temporarily checks th
assimilation of nutritive material is an event always to be regarded wi
anxiety. Such a condition is not an uncommon sequence to severe operation
and often causes death, even after the more immediate effects of the operatio
have been recovered from. In the case of pulmonary catarrh there is a speci
danger which is independent of the severity of the catarrh. Collapse of th
lung is always threatened in every case of cold on the chest in a weakl
infant; and if the collapse be extensive and quickly produced, the child ma
die suddenly. It is a consequence of this dangerous character of mere fun
tional disorders that post-mortem examinations in young children are so ofte
unsatisfactory. Nothing at all may be found to indicate the cause of deat
or the appearances observed may be quite insufficient in themselves to accou
for the fatal result.

The intense excitability of the nervous system, which under ordinary ci
cumstances impresses their peculiar character upon the disorders of early lif
gradually diminishes and disappears under the influence of chronic enfeebli
disease, and in its stead we find a condition exactly the opposite to that whi
has been described. Here, the nervous system appears nearly insensible
all sources of irritation; the general symptoms are almost completely absen
and the local symptoms are so slight and obscure that they may easily esca
notice. Thus inflammation of the lungs occurring secondarily in a cachect
child may present hardly any symptoms at all. The temperature may
only slightly elevated, and quickly falls; the cough is rare or absent; and a
increase in the general weakness is the principal sign by which this serio
complication is manifested.

In the child, then, we must be prepared for these two very opposite co
ditions; in the one case, a violent reaction of the whole system against th
most trifling disturbance; in the other, a profound insensibility to nervo
impressions, the system assuming for the time many of the physiologic
characters of old age, and responding faintly, if at all, to the stimulus
local irritations.

The clinical examination of infants is seldom difficult, for very you
children as a rule can be easily managed with a little patience. Older ch
dren, however, are often very suspicious of "the doctor," and sometimes, e
pecially if badly brought up and petted and spoiled, may resist all our effor
to examin them; but even in these cases much may be done by gentlene
and deliberation. It is important not to be in a hurry; and, besides, it is we
to accustom the patient to our presence in the room before proceeding to
physical examination. This interval may be conveniently occupied by i
quiring into the history of the attack; and, if there be other children of th
same family, it is advisable to see them, for information may in this way
gained as to constitutional and hereditary family peculiarities. The inform
tion to be derived from the mother is often of the greatest value, and her a
count of the symptoms should be always received with attention and ca
fully weighed. If she be a person of intelligence, many minute points in th
history of the beginning of the attack can thus be collected; and these, in a
obscure case, may be of the utmost importance. If the patient be an infa

it is advisable to see him first during sleep, for those parts of the examination during which perfect quiet is indispensable can seldom be satisfactorily conducted unless the child is unconscious of what is passing around him. At this time, then, we can note the expression of the face, can observe the attitude and any involuntary movements of the body; we can count the number of respirations, feel the pulse, and ascertain the temperature of the body by gently introducing the ball of the thermometer, wetted or oiled, into the rectum. It is better to take the temperature in the rectum rather than in the axilla; for, besides that the result thus obtained is more to be relied upon, as the skin of infants is quickly cooled by slight exposure, and does not therefore always furnish trustworthy information as to the heat of the body generally, the method is also more convenient. Infants usually resent very strongly the amount of constraint necessary to keep the arm firmly in contact with the side, and are often so noisy and unmanageable in consequence that little afterwards can be done with them in the way of examination. With regard to the temperature of children, it may be noted that we must not allow ourselves to be deceived by sudden and rapid rises of temperature into the belief that the patient must necessarily be suffering from serious disease. Very slight causes will in infants produce a remarkable increase of heat; and during natural dentition, just before the passage of the tooth through the gum, a temperature of 104° or 105° Fahr., even in the morning, is not at all an uncommon circumstance. Besides, the normal temperature of young children is rather higher than that of the adult. In a perfectly healthy child of three or four years old the thermometer will often register a morning temperature of 99 1-2°.

The pulse of infants can seldom be counted except during sleep, and even then involuntary movements of the arm and twitching of the tendons of the wrist render the operation not always an easy one. The finger should be laid very lightly upon the artery, and any temporary restlessness which may be excited in the limb by the touch should be allowed to subside before we begin to take the number of pulsations. The pulse is rather slower during sleep, and is then often irregular in force; but the slightest movement of the body causes a sudden quickening in the number of beats, and at the same time the force of the beats becomes equalized, and remains so for a few seconds, or as long as the increase in rapidity is maintained.

Whatever may be the disease for which we are called to see an infant, we should always make a thorough examination of the whole body; and therefore, when we have satisfied ourselves as to the points which can only be successfully noted during sleep, it is well to have the clothes entirely removed, so that we may have the whole body exposed to view. If the child cry during this process, we should pay attention to the quality of the voice, for hoarseness is one of the early signs of inherited syphilis.

Placing the infant naked on the nurse's lap, the body must be examined for signs of eruption or any appearance of swelling or local inflammation; the condition of the skin must also be noted—as to softness and suppleness, dryness, or moisture—for a harsh, dry skin is a frequent accompaniment of chronic abdominal disease. At the same time the condition of the belly can be ascertained, paying attention to the hardness or softness of the parietes, and to the size, whether normal or otherwise, of the liver and spleen. The existence of abdominal pain or tenderness can also be detected without much difficulty.

Children breathe more quickly than adults. Under the age of two years the number of respirations in the minute may be taken as about thirty. After that age the rapidity gradually diminishes, but at any moment in young subjects the respiratory movement is apt like the pulse to be temporarily quickened by trifling causes.

The respiration of infants is chiefly abdominal, on account of the shape of the thorax. In a new-born child the antero-posterior diameter of the chest is scarcely less than the lateral, and this nearly circular shape allows of little further lateral expansion. The circular shape, however, soon changes to the elliptical, and the chest becomes broad out of proportion to its depth. In a perfectly healthy child there is at each inspiration a certain recession of the lower part of the chest-walls, for the yielding ribs are forced inwards by the pressure of the air before they can be sufficiently supported by the expanding lungs. Disease, however, may greatly increase this recession, and in certain cases we notice a deep furrow appearing across the chest at each inspiration, and marking the upper borders of the abdominal viscera. The extent of the recession is a sign of the degree of difficulty with which the air enters the lungs, and should always be noted during inspection of the chest. The impediment may be created by softening of the ribs, as in rickets, which renders difficult the proper expansion of the thoracic cavity, or by disease of the lungs and air-passages, which presents a direct obstacle to the entrance of air.

The examination of the chest in an infant is not attended with any great difficulty. In severe chest complaints the child is almost always quiet, as crying interferes with the respiratory act, upon which his whole attention is concentrated. Much noise and resistance, then, may be taken as a sign that the lungs are not seriously affected. If a child with any abnormal dulness at the base of the chest cry loudly, the disease is almost certain to be pleurisy.

The infant should be first placed in the nurse's arms, with his chin resting upon her left shoulder, and his left arm around her neck. If necessary, the chin can be kept down by the nurse's hand placed upon the child's head. In this position the muscles of both shoulders are relaxed, and percussion of the supra-spinous fossæ can be relied upon. As the resonance differs considerably, according as to whether percussion be made during inspiration or expiration, it is important that this should be made on each side at the same period of the respiratory movement. Infants are fond, when under constraint of any kind, of holding their breath in the intervals of crying; and as they always do so at the end of an inspiration, this is a favorable opportunity for employing percussion of the two sides. Percussion should always be *mediate*, and it is by far the most convenient to use the first finger of the left hand as a pleximeter. It is best to use two fingers, as well as one, in striking; for by this means, without using any greater force, a larger volume of sound is elicited, and an amount of dulness which might escape notice were only one finger employed, can by this means be readily detected.

It must be remembered that during expiration the liver rises higher in children than it does in adults, and that, therefore, the right base is naturally less resonant than the left immediately before a fresh breath is taken.

In auscultation the stethoscope should always be made use of. It has the great advantage of limiting the area within which the different respiratory sounds are perceived; and this, when, as in a child, the area is small, and sounds from the nose and throat are so rapidly conducted, is a matter of considerable importance. If not seriously ill, the child usually cries during the examination; but this will not prevent our acquiring all necessary information, for during inspiration the cry usually ceases, and in this interval of silence we can ascertain the quality of the breathing, and the presence or absence of adventitious sounds. Afterwards we notice whether or not the cry is unnaturally resonant.

To examine the front and sides of the chest the infant should be laid upon a pillow; and it is convenient to have this latter placed upon the table so as to raise up the patient to a convenient height. By this means the examination can be made thoroughly and without that inconvenience which the practitioner experiences when he stoops down to examine a child lying upon his mother's lap. After exploring the lungs the heart sounds can be listened to during inspiration in the intervals of the cry.

In older children an examination of the chest should never be omitted, whatever may be the nature of the symptoms; for inflammation of the lung often begins very insidiously, and the symptoms of pleurisy are frequently obscure.

The respiratory sounds are of a more blowing quality in children than they are in adults, and this quality is more remarkable in inspiration than it is in expiration, which latter, indeed, is often very weak, and sometimes hardly perceptible. In cases of inflammatory affections of the lungs the rhythm of respiration may become altered, the pause taking place at the end of inspiration, instead of at the end of expiration. This is not characteristic of any special disease, but is common to all cases where the function of the lungs is interfered with. During examination of the chest the patient's mouth should, if possible, be open, as by this means the transmission of sounds generated in the throat is to a considerable extent prevented.

The examination of the mouth should be reserved for the end of the investigation, as it often excites very great resistance on the part of the patient. By placing the finger upon the child's chin, and using a little gentle pressure, the mouth opens and the tongue is often protruded at the same time ; if not, we can with a pencil-case press down the lower jaw and tongue, and thus obtain a very good view. Afterwards we should run the forefinger along the gums, and ascertain their condition as to heat and swelling. If there be fever, the cause of which our previous examination has left undetected, the throat should always be inspected, depressing the tongue with the handle of a spoon for the purpose. Lastly, if vomiting or diarrhœa be present, the discharge should be looked at ; in diarrhœa especially this is of importance, as the method of treatment to be adopted will depend very much upon the exact character of the stools.

The *diagnosis* of disease is not more difficult in the child than it is in the adult ; in some respects it is easier, for although the infant cannot himself describe the symptoms, we have in the mother a ready recorder of all changes visible to the eye, while the facility with which the whole body of the patient can be examined leaves us little excuse if, from want of due diligence, any affection appreciable by the eye, the ear, or the finger be passed over. In all cases of acute disease, before the removal of the clothes, we should be careful to take the temperature with a thermometer, and to count the respirations, and, if possible, the pulse. The respirations especially should not be neglected, for, if the breathing be not labored, mere rapidity of breathing may easily be overlooked, unless special attention be directed to it.

It is at the beginning of the attack that diagnosis is especially difficult. In determining the nature of the complaint at this time, we must take into account the peculiarities of children, and, remembering the nervous excitability of young subjects, must not allow our attention to be diverted by the signs of general excitement from noting the more special symptoms which point to local distress. In all cases we should endeavor to obtain from the mother a clear account of the history of the attack, so as to be able, if possible, to fix a definite time for its beginning. A careful examination should then be made of the whole body, and by this means a diagnosis can often be arrived at immediately.

In estimating the nature of the complaint we shall often derive assistance from our general knowledge of the course of disease; of the special complications by which certain disorders are apt to be accompanied; and of the pathological consequences which may follow the occurrence of acute illness. Thus, in rickets we remember the extreme susceptibility of the body to changes of temperature and anticipate catarrhal derangements. Being aware, also, of the singular convulsive tendency in this disease, we are not alarmed by the occurrence of convulsive attacks, but at once search for some external source of irritation by which such attacks may be explained. Again, knowing the frequency of rheumatic fever in early life, and the rapidity with which the heart becomes affected secondarily, although the articular symptoms may be insignificant, the slightest stiffness in the joints, accompanied by a rise in the temperature, should at once suggest a most careful examination of the heart and chest generally. After an attack of measles or of hooping-cough, we should be on the watch for catarrhal pneumonia and acute tuberculosis. After scarlatina we look for acute desquamative nephritis and dropsy. In all cases where the symptoms are obscure and indefinite, and the most thorough examination fails to supply any sufficient materials for a positive conclusion, we must note the presence or absence of diathetic conditions—whether or not there be in process of development any constitutional state which might be itself the cause of disease, or might predispose special organs to be more readily affected by injurious influences; secondly, we must take into account any prevailing epidemics to which the patient may have been exposed; and lastly, we must inquire into the hygienic and dietetic conditions under which the child has lately been living. Still, in many cases it will be necessary to wait before we can decide upon the nature of the ailment. In case of doubt no positive opinion should be hazarded, for few mistakes are more fatal to the reputation of the practitioner than to class as trifling a complaint which is afterwards discovered to be of a serious character.

In the *prognosis* of disease in children it is necessary to speak with much caution, for changes in them take place with great rapidity, and the expectations of one hour may be completely falsified by the next. In the early stage of an acute disease we must not allow ourselves to be deceived by the seeming severity of the symptoms, nor, when the disease is fully established, must we too hastily assume, however grave the condition of the patient, that the case is necessarily a hopeless one. In early life the readjusting power of nature is very great, and instances of unlooked-for recovery must be familiar to every one whose practice has lain much amongst young children. When physic has become useless, careful nursing still remains; and the aphorism, "as long as there is life there is hope," is especially true in the case of a child. On the other hand, we must be careful not to err in the opposite respect, and to pronounce too favorable an opinion in a case of serious disease because the symptoms for the time are mild; for, if cases frequently change rapidly for the better, they also often change rapidly for the worse. Indeed, sudden death is not at all uncommon in very young children, especially in cases of acute disease where the strength has been very suddenly reduced; and chronic diseases sometimes end very abruptly.

Children are more amenable than adults to the action of drugs, and the *treatment* of their disease is consequently more easy. But treatment does not consist entirely, or even principally, in the administration of medicines. By attention to diet, hygiene, and the general management of a child, we can exercise a very important influence upon the course and termination of an ailment; and the mere giving of physic is only a small part of the duties of a physician.

In treatment, our first object should be to remove, if possible, the cause of the disorder. The cause is, however, often obscure, or, if detected, may be no longer in existence, the disease being merely the effect of some transient impression which has ceased to operate. In most functional derangements, however, especially those affecting the alimentary canal, some error in feeding or in management may usually be discovered, the remedying of which will produce an immediate improvement in the symptoms; and in all cases the cause or causes should be diligently searched for, and the removal of them, when found, should be looked upon as the first and most important step in the treatment. Without this preliminary step, indeed, treatment will often meet with little success. Thus, in the case of rickets, we shall find very little benefit from the administration of tonics and cod-liver oil so long as the child continues to be fed on indigestible food, and to live in a close, ill-ventilated residence. Here treatment consists essentially in removing the causes which are producing the disease; for cleanliness, fresh air, and a nutritious, digestible diet will by themselves be sufficient in mild cases to cure the disease without any aid from drugs being required.

Indications for treatment are also furnished by the nature and seat of the disease; but in following such indications we must not allow ourselves to be led away too much by narrow rules as to drug-giving. In all cases we should be careful to treat the patient rather than the disease. Our object is to hasten the restoration of the child to health; and this end will be gained far more effectually by attending carefully to symptoms—general as well as local—rather than by pursuing any one rigid line of treatment to which the malady is expected to succumb. It is, indeed, especially the case with children that the consideration of symptoms is of the first importance, whatever be the nature of the disorder; and in many cases treatment must be directed exclusively to these, although they may arise from a distant organ, and be the result of the general disturbance produced in the system through sympathetic irritation excited by some general or local ailment. Thus, the vomiting which frequently accompanies the onset of fevers and local inflammations may assume so violent a character as to place the life of the patient in peril. The beginning of variola is especially liable to be accompanied by excessive vomiting. In such a case treatment must be directed at once to control the dangerous symptom, and this irrespective of the seat or nature of the complaint in the course of which this complication has arisen. So also in cases of sympathetic convulsions occurring in the course of an acute disease, measures must at once be taken to quiet a perturbation of the nervous system which might exercise a very unfavorable influence upon the termination of the illness.

In acute cases the treatment will vary very much according to the age of the child, according to the presence or absence of diathetic or constitutional conditions, and especially according to whether the case be one of primary or secondary disease. If the child be very young, or be of feeble constitution, or be already weakened by previous disease, we should be careful not to depress; but, on the other hand, we cannot always hope by mere stimulation t[illegible]er the evil day, in the expectation that by such means the patient may be enabled to outlive the disease. Too early stimulation in certain diseases, such as bronchitis and croupous pneumonia, will be found merely to increase the severity of the inflammation, and may by itself be sufficient to determine the fatal issue. In bronchitis, especially, death has, I believe, been often caused in young children by a too early administration of carbonate of ammonia. Medicines—and stimulants do not belong to the least valuable class—are beneficial when selected with judgment, and given at a proper time; but they may be very hurtful when given imprudently and without discrimination. It is, then, of especial importance in dealing with children, upon whom the action of medicines is so powerful, that we should have a distinct idea of the object sought to be obtained by the administration of a drug—that we should have a definite therapeutic purpose in all we do. Therefore, until we find some trustworthy indication for the use of a drug, we should be careful to give nothing of importance, but should content ourselves with ordering some harmless fluid, watching meanwhile for any symptoms which may arise to guide us to the employment of more active measures.

There is one class of remedies which is of singular value in the treatment of the diseases of young children, viz.: the alkalies. In all children (in infants especially) there is a contant tendency to acid fermentation of their food. This arises partly from the nature of their diet, into which milk and farinaceous matters enter so largely; partly from the peculiar activity of their mucous glands, which pour out an alkaline secretion in such large quantities. An excess of farinaceous food, therefore, soon begins to ferment, and an acid is generated, which stimulates the mucous membrane to further secretion. In all chronic diseases, and in many of the acute disorders, this sour condition of the stomach and bowels is present. Alkalies are, therefore, useful—firstly, in neutralizing the acid products of this fermentation; and, secondly, in checking the too abundant secretion from the mucous glands. A few grains of soda or potash, given an hour or two after taking food, will quickly remedy this derangement and remove the distressing symptoms which arise from it. In the chronic diseases, indeed, attention to this point is of especial importance: for by placing the stomach and bowels in a healthy state, and insuring a proper digestion of food, we put the child in a fair way of recovery, and prepare the way for the administration of tonic and strengthening medicines, by which his restoration to health is brought about.

In prescribing for infants an aromatic should always be included in the mixture. The aromatics are useful not only for their flavoring properties, but also for their value in all those cases of abdominal derangement where flatulence, pain, and spasm, resulting from vitiated secretions and undigested food, are present to increase the discomfort of the patient. Such dyspeptic phenomena are usually relieved rapidly by the use of these agents; and aniseed, cinnamon, carawayseed, or even tincture of capsicum in minute doses, will be found important additions to the prescription in all cases where alkalies are required.

With regard to quantity:—The proper dose of a medicine cannot always be calculated according to the age of the child, and does not in all cases bear the same proportion to the quantity suitable for an adult. For certain drugs children show a remarkable tolerance, while to the action of others they show as remarkable a susceptibility. Thus opium, it is well known, acts upon a child more powerfully than would be expected, judging from the mere difference of age. It should, therefore, be given to infants with a certain caution, especially if the child be enfeebled by disease. It is, however, a medicine which is of especial value in the treatment of the diseases of infancy, and may be given without fear if care be taken not to repeat the dose too frequently. Belladonna, on the contrary, can be taken by children in large quantities. A child of two or three years old will bear without inconvenience a dose which in an adult might produce very uncomfortable symptoms.* Lobelia, again, is a remedy which is very well borne by children. Dr. Ringer has given it to "very young children" in doses of five minims every hour, and in no case has he noticed any ill effects to follow its administration. Arsenic should be given to children over five years of age in the same dose as that used to adults, and infants of a month or two old will take one drop of Fowler's solution three times a day with great benefit in cases of gastric catarrh. The influence of mercury upon young children deserves remark. It seldom in them produces stomatitis or salivation; but an excess of the drug is not, therefore, harmless: its influence is seen in the irritation of the alimentary canal which it so often excites, and in the profound anæmia which it induces. The anæmia which is so common a sequence of constitutional syphilis in infants is no doubt often a result of too long continued mercurial treatment.

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* It is important to remember this in giving belladonna for its sedative effects, as in pertussis.

When the physician has prescribed the necessary medicines, and given directions as to the diet and general management of the child, his duties are not necessarily ended. It is his part not only to advise, but also as far as possible, to see that his directions are carried out. The soundest advice is useless if it be not put into practice, and all the art of the physician may be neutralized by weakness or indifference on the part of the attendants. From a feeling of injudicious fondness a mother will sometimes neglect the duties entrusted to her, through a fear of inflicting pain or an unwillingness to subject the child to annoyance. In these cases the medical attendant should impress upon her the importance of the measures to be taken, and should remind her that he is there only as an adviser, while it is her task to put his advice into practice. During an illness a child is too often considered as one whose slightest desire is to be instantly gratified, on the ground that opposition might aggravate the severity of his complaint, even if it did not exercise an unfavorable influence upon the issue. A fretful, petted child well knows how to take advantage of this feeling, and the unwise indulgence of those around him is often the most serious obstacle to his recovery. If, however, a child be well enough to form unreasonable wishes, he is not too ill to bear the disappointment of a refusal, and the mother should endeavor with gentle tact to divert her child's thoughts from any hurtful inclination of the moment, remembering that the truest kindness consists in abiding strictly by the direction of the physician, and in allowing nothing which would in any way interfere with recovery.

## CHAPTER II.—COLLAPSE OF THE LUNG (POST-NATAL ATELECTASIS).

Collapse of the Lung a Common Lesion in the Child—Method of Production and Causes which Induce It—Anatomical Characters—Symptoms and Physical Signs.
Case I.—Sudden Death from Pulmonary Collapse in a Weakly Wasted Infant.
Case II.—Collapse of Lung occurring in a Case of Pertussis—Comment.
Case III.—Collapse of Lung with Laryngismus Stridulus—Comment.
Case IV.—Bronchitis and Collapse of Lung in a Rickety Child—Comment.
Diagnosis of Pulmonary Collapse—Treatment.

COLLAPSE of the lung is one of the most important diseases of early life. When occurring after the lungs have been fully expanded at birth it is almost always the result of pulmonary catarrh, and is one of the causes which render bronchitis so fatal a disease in the child.

Pulmonary collapse had long been recognized as a lesion common enough in the bodies of young children, but its nature had been always misapprehended until MM. Legendre and Bailey first demonstrated the possibility of reinflating the patches of collapse, and thus indicated the true nature of the lesion. Before these experiments all cases of collapse of the lung found after death in the dissecting-room had been supposed to be cases of catarrhal or lobular pneumonia. Since these experiments the tendency has been to go to the opposite extreme, and to look upon all cases of catarrhal pneumonia as cases of collapse. The two conditions are, however, quite different. Collapse of the lung may lead to catarrhal pneumonia, inflammation taking place in the collapsed portions; but, until such inflammation occur, the case is not one of lobular pneumonia, but only of lobular collapse.

The immediate cause of collapse of the lung is the presence of mucus in the tubes, and to Dr. Gardiner, of Edinburgh, we are indebted for a simple and conclusive explanation of the mechanism by which this exhaustion of the lobules is effected. A plug of mucus is carried inwards by the force of inspiration along an air-tube of constantly diminishing calibre, and becomes at last arrested, obstructing the whole channel of the tube. Although, however, the narrowness of the air-tube prevents its further advance, the plug of mucus can still be moved in a direction contrary to that in which it has lately passed. At each expiration, then, it is dislodged sufficiently to allow the passage outwards of some of the air still left in the air-cells; but at each inspiration it is driven back again into the tube, so as completely to close it against any air entering to replace that which has just escaped. By several repetitions of this to-and-fro movement the air in the lobules beyond the obstruction becomes completely exhausted, and collapse is the result.

This mechanism may take place in several spots in the lung at the same time, and the extent of the collapse in each instance depends upon the size of the plug and the point at which the obstruction of the bronchial tube takes place.

The above is the immediate cause of collapse of the lung, but the process is assisted by anything which renders difficult the entrance of air into the bronchi. There are, therefore, predisposing causes which promote the retention of mucus in the tubes, and assist its obstructive action. Of these the first is an inability to cough and expectorate. New-born infants do not know how to cough, for the act of coughing is only in part an involuntary act; it is in great part due to an effort of volition to remove an impediment to free respiration. The infant, then, is conscious of the impediment to the free passage of air, but has not yet acquired a knowledge of the means by which it may be remedied, and the mucus remains in the tubes because the child does not exert the force necessary to expel it.

Again, the child may be unable to cough. For the act of coughing, a quantity of air must be drawn in past the obstruction; the glottis is then closed, and pressure is brought to bear upon the lungs by the expiratory muscles. While the pressure is at its height, the glottis is relaxed, and a blast of expired air rushes out, carrying with it the mucus which caused the obstruction. If, however, a sufficient quantity of air cannot be drawn in past the collection of mucus, or if the general weakness be so great that adequate pressure cannot be brought to bear upon the lung, the effort is insufficient to cause expulsion of the phlegm in the tubes.

Another predisposing cause of collapse is weakness of the inspiratory act. This may be a result of general exhaustion, the patient being too feeble to take a deep breath, and is often the cause of extensive collapse in dying persons. Air is drawn but imperfectly past the mucus at each inspiration; while at each expiration the air in the vesicles is expelled by the natural elasticity of the lung. After a time the cells become completely exhausted of their air, and sink in.

The act of inspiration may, however, be weak from other causes than actual muscular debility. The patient may be prevented mechanically from expanding his chest-cavity, either from some impediment in the abdomen to the descent of the diaphragm, or from deficient rigidity of the thoracic walls, which cannot resist the pressure of the external air. Thus, ascites or tumors distending the abdomen may so interfere with the descent of the diaphragm that the inspiratory effort is too feeble to draw in air past the mucus; and in such cases a comparatively trifling bronchitis may lead to very extensive collapse, for the residual air soon becomes exhausted, and the vesicles sink in. In infants, whose nearly circular chest allows of little lateral expansion the respiration is principally diaphragmatic; any obstacle to the action of this important muscle is therefore in them attended by the most serious consequences.

Again, a want of rigidity of the chest-wall in the child greatly assists the production of collapse. Even in a healthy child the parietes of the chest are very flexible, as is seen in all cases where there is any difficulty of respiration. The ribs at the lower part sink in under such circumstances, so that very imperfect dilatation of the lower lobes of the lungs takes place. If, however, the ribs are softened by rickets, the flexibility of the thoracic parietes is very much increased. No dilatation of the lower part of the chest takes place at all: instead, there is at each inspiration so much recession of the parietes of the thorax in the inferior regions that very little air indeed is able to penetrate into the lower lobes of the lungs. If bronchitis come on in such a patient, the recession of the chest walls becomes greater than ever, for the presence of secretion in the tubes offers an additional obstacle to the entrance of air. Any air, therefore, which the lower lobes may contain soon becomes expelled by the elasticity of the lung, and collapse of that portion of the lung takes place.

Of these causes the presence of mucus in the tubes is the only one to which the occurrence of collapse can be *directly* attributed; the others are merely predisposing causes. By themselves it seems improbable that they are capable of producing collapse; they can only aid the obstructing influence of bronchial secretion.

Infants are especially liable to this lesion, because their bronchi are sm and easily obstructed; besides which, they are feeble and quickly depress and their chest-walls are naturally deficient in rigidity and yield readily external atmospheric pressure.

The size of the portion of the lung which has become collapsed varies, has been said, according to the size of the plug of mucus, and the point which the obstruction of the bronchial tube takes place. Collapse is the fore said to be either diffused or lobular, according as it affects numerous joining lobules over a considerable surface, or is limited to single ones or single clusters. In the diffused form the greater part of a lobe is often fected, usually at the posterior region, and the circumference is less distinct circumscribed than is the case with lobular collapse, the collapsed portion bei seen to pass gradually at many points into the (usually) emphysematous tiss around. The lobular variety is often situated at the anterior edges of t lungs, although it may occupy any other part, and is very abruptly mark off by the interlobular septa. In either case the collapsed portion is solid, b still soft, to the feel; it is tough and not easily broken down, does not crepita and sinks instantly in water. It is depressed below the level of the surrou ing lung, and is more or less purple in color, the depth of tint depending u on the amount of blood contained in the tissue. When cut into, the secti is smooth, and much blood or bloody serum exudes on pressure. Lastly, the affection be recent, the collapsed portion of lung can be completely re-i flated through the bronchus. This is a very valuable test, and conclusive proves the nature of the lesion. If, however, the collapse be less recent, co plete distension cannot always be effected, for where the lesion is of lo standing certain nutritive changes are apt to take place in the inacti vesicles, which to some extent alter the structure of the lung at the seat disease; and in cases where pneumonic changes have begun in the tissue, p fect re-inflation becomes impossible.

The *symptoms* of pulmonary collapse vary to a certain extent, according the area of the lung involved in the disease. If the collapse be very sudd and extensive, so as very rapidly to arrest the functions of a large part of bo lungs, death may follow almost immediately. This is not at all an unco mon cause of death in hooping-cough, or in cases of catarrh attacking you and weakly children whose strength has been rapidly reduced by some e hausting disease, as a severe attack of diarrhœa. In cases where the porti of lung collapsed is less extensive, the occurrence of this complication is oft indicated by a convulsive fit, and the fits may be repeated again and aga until death ensues. Convulsions are indeed not an uncommon sympto even in cases where the area of lung involved is small, although they are no means present in every case.

A child in whom collapse of the lung occurs begins at once to exhi evident signs that the pulmonary catarrh from which he has been previous suffering, is no longer uncomplicated. He becomes restless, and moves h arms uneasily about. His face shows signs of distress, and his features b come pinched. The eyes are hollow, the lips bluish, and the eyelids a mouth livid. He whines plaintively, but seldom cries. The skin is cool, a often moist with a cold clammy perspiration, and a thermometer placed the rectum shows that the internal temperature of the body is little, if at a elevated above the natural level. The pulse is very small and feeble, a rather hurried. The breathing is irregular, shallow, and exceedingly rap often reaching 60, 70, 80, or even more, in a minute; and this rapidity breathing causes a perversion of the pulse-respiration ratio which is not e ceeded even in cases of the severest pneumonia. The nares dilate widely each inspiration, but the inspiratory efforts are seldom violent, except in so cases of rickets when there is much softening of the ribs. The cough becom very feeble, and sometimes seems almost suppressed. In some cases the tempt to cough is followed by gasping efforts, as if the child were being s focated, while the lividity of his face is increased, and his limbs are agitat by spasmodic movements. When the collapse is extensive, the child w take little food, and if an infant, generally refuses the breast. This is part occasioned by his respiratory wants, but it often also proceeds from a difficul in swallowing, which is a frequent symptom in the disease.

Physical signs when they occur, are found at once, and the rapidity wi *wh*[illegible] arise is an important element in the diagnosis. On examinatio [illegible] *mmonly* found at one or the other base, with slightly increas resistance. This is in most cases limited to one region of the thorax, usually the posterior base. Sometimes the lesion is found in the two lungs at the same time; when thus symmetrical a favorite seat is a narrow vertical strip, extending two or three inches along each side of the spine. The dulness is best detected by gentle percussion with one finger. It is seldom complete, and is often difficult to estimate, on account of the presence of emphysema; for where the collapsed area is of small extent, local dilatation of the air-cells may render the sound elicited by the finger perfectly clear, or the percussion-note may have merely a slight wooden quality, which presents nothing characteristic. With the stethoscope we hear bronchial breathing, which may be loud and intense, or weak and faintly marked. There is usually a certain amount of coarse crepitation, which is produced, not in the collapsed portion itself, but in the tissue around. Vocal resonance may be increased over the seat of collapse, but more often it is annulled. The same may be said of vocal vibration; but in children vibration of the chest-wall is often absent, even in healthy subjects, and this sign is therefore seldom serviceable in diagnosis. It is only in cases where several contiguous lobules are affected—that is to say, where the collapse is diffused, and then only when the lesion is in contact with the chest-wall—that any physical signs are present. In cases where solitary lobules are exhausted of their air, or where the diseased condition is seated in the interior of the lung, no evidence at all is to be derived from examination of the chest.

For the production of this lesion it is not necessary that the pulmonary catarrh should be a severe one; cases even of slight catarrh may be followed by rapid death, when the patient is very young and has been lately reduced by some exhausting disease.

### CASE I.—SUDDEN DEATH FROM PULMONARY COLLAPSE IN A WEAKLY WASTED INFANT.

Edward K., 10 months old, one tooth, a very small and miserable-looking child, was admitted into the East London Children's Hospital on October 15. He had been suffering for some months from chronic diarrhœa, and had been wasting more or less all his life. A rigid diet, from which milk was carefully excluded, combined with warmth and an astringent mixture, soon stopped the diarrhœa, and the child was just beginning to regain flesh, when on October 26th he was noticed to have a slight cough, with a little rattling of phlegm in the chest. He, however, took his food as usual, and nothing occurred to occasion the slightest anxiety, when early on the following morning he was found to be very greatly altered in appearance. His face was livid, and his breathing very rapid and shallow. On examination of the chest, the breathing was very weak and distant, but was unaccompanied by rhonchus. He had no convulsions, and died quietly very shortly afterwards. On examination of the body, a pyramidal strip of collapse was found at the posterior surface of each lower lobe, reaching upwards to the upper border of the lobe. The breadth of each was about an inch and a half at the lower border, and the thickness about half an inch. They could not be entirely reinflated. The large intestine throughout its whole extent was inflamed along the summits of the longitudinal folds of mucous membrane. In the small intestine Peyer's patches were injected, and there was some arborescent congestion of the mucous membrane. There were no ulcerations.

In the above case the physical signs were only imperfectly ascertained. When seen by the House-Surgeon, the child was evidently dying, and it was thought unadvisable to disturb him more than was absolutely necessary; otherwise, no doubt, careful percussion would have revealed the existence of dulness over the collapsed portions of the lung.

### CASE II.—COLLAPSE OF THE LUNG OCCURRING IN A CASE OF PERTUSSIS.

Albert S., age 1 year and 9 months, twelve teeth, was seized, on April 22, with a severe attack of diarrhœa, which considerably depressed his strength, for although he had for two months been able to walk, he was now scarcely able to stand. All his joints were nodular and his ribs beaded, but there was no actual deformity of the chest. The diarrhœa was soon arrested by treatment, but on April 29 he began to cough a good deal, and a week afterwards hooping-cough was completely developed.

May 10.—Hoops very much, and the fits of coughing are very frequent, and are invariably followed by vomiting, so that very little food is retained upon the stomach. Medium-sized bubbling is heard over both sides of back. Temperature in axilla, 100 Fahr.°

May 14.—The fits of coughing are less frequent, but the laryngeal spasm is very intense, and the child gets purple in the face after each attack. Even between the attacks the lips remain very dark in color, and the eyelids purplish. Skin moist and not hot. Subcrepitant rhonchus is heard all over back.

May 17.—On the evening of May 15 the child had a fit of convulsions which lasted ten minutes. Since then he has seemed very weak, and has taken nothing but occasionally a little broth. Perspires a good deal. Temperature, 99.4° ; pulse, 180. Lies back with head low ; pale and moist-looking in face ; eyelids and lips dark red ; lividity under eyes. Respiration very rapid, 120, and nares acting, but the breathing is very shallow, and there is no contraction of accessory muscles. The cough is evidently painful, for the child makes unusual efforts to prevent it. When the desire to cough comes on, the face becomes congested, the eyes get fixed, the brows contract, and sweat breaks out on forehead. Has not hooped since yesterday evening.

On examination of the chest there is a little dulness at the right base behind, and the breathing there is higher-pitched and drier in quality than on the opposite side. Subcrepitant rhonchus is heard at each base, back and front .

On the following day, May 18, the convulsive attacks returned with great violence, and the child died.

AUTOPSY.– The lower half of the inferior lobe of the right lung was found in a state of collapse, and there were smaller patches of collapse scattered about the upper part of the same lobe. There was also a little collapse of the lower lobe of the left lung, but this was much less extensive than on the right side. There was no trace of pneumonia, but the lining membrane of the larger tubes was a little reddened. At the anterior border of the interior lobe of the right lung a string of quite recent lymph was found, and there was a little reddening of the opposed surfaces of the pleura in that situation.

Hooping-cough, when severe, has always a tendency to cause collapse, for a violent fit of coughing with extreme spasm reduces the quantity of residual air to a very low point, while at the same time the exhaustion which follows a severe paroxysm weakens the force of the inspiratory act. The thick, ropy mucus contained in the air-tubes offers already an obstacle to the entrance of air, and the rapid feeble breathing which is noticed during the periods of depression is little calculated to overcome the difficulty. In such cases the stages which mark the production of collapse are—

1. Partial exhaustion of the air-cells during the prolonged cough.
2. State of great depression, during which tne inspiratory efforts are insufficient to draw in air past the mucus which loads the tubes.
3. Passage outwards at each expiration of some of the residual air left in the cells.

Unless, therefore, the strength of the inspirations can be increased, or the obstructing mucus can be dislodged, the occurrence of collapse may be looked upon as in the highest degree probable. If rickets be present in addition, the obstacle to full inspiration offered by the softened ribs increases still further the danger of the case.

In the above example the child was the subject of rickets, and had besides been already much depressed by the abdominal disorder before the hooping-cough began. The cough was very violent and the spasm severe, and the further reduction of strength which resulted from the excessive vomiting was so great that the occurrence of collapse could be looked upon as almost a certainty. The evident pain excited by the cough was an unusual feature in the case ; for although children frequently strive in pertussis to repress the cough when they feel it to be coming on, yet they seldom manifest any sign of actual pain in respiration. The existence of pain was, however, quite accounted for by the local pleurisy discovered on examination of the body—an unusual complication of collapse of the lung,

### CASE III.—COLLAPSE OF THE LUNG WITH LARYNGISMUS STRIDULUS.

G. E., one month old, a fat, well-formed child, was first seen on July 28. He had been quite well until two days before, when he began to cough. The cough had since increased, and had sometimes been followed by what were described as "fits." He was said to take the breast well, but to vomit a part [illegible] very shortly afterwards.

When first seen—Child rather red in face; seems rather depressed; pulse 116; respiration 82. Breathing shallow as a rule, but the respirations are not all of equal depth, and there is sometimes considerable recession of the lower part of the chest during inspiration. Skin does not feel at all hot to hand.—Temperature in rectum 100.4°. The child gives a single or double hack at intervals, and sometimes seems as if he could not draw his breath immediately after it, so that his face gets congested and his eyelids and mouth become livid. On one occasion after the cough he had one of the so-called fits. His eyes became fixed, his limbs were moved uneasily about for a few seconds, and his face was livid; he afterwards lay motionless with closed eyes for some minutes, during which the pupils were contracted as in ordinary sleep; they acted readily with light. The fontanelle is slightly depressed. He perspires a little about the face. The bowels are rather confined, and he has not passed water all day.

On examination of the chest, a little incomplete dulness is found at the right base behind, with slightly increased resistance. The respiration is very weak, and when the child takes a deep breath, which occurs at rare intervals, a fine subcrepitating rhonchus is heard at the end of inspiration.

A mixture containing bromide of potassium and sal volatile was ordered; and the frequent application of weak mustard poultices was recommended to the chest and back.

July 30.—Since last report the child has had four "fits." He seems very much in the same state as before. Still takes the breast well, but is said to pass very little water. The same difficulty of breathing and lividity are noticed after the cough. Pulse 144; respiration very shallow and irregular, 76; temperature in rectum, 98°. Lies with mouth closed, and nares not acting. No dulness is found now at the left posterior base, but all over both sides of back a fine subcrepitant rhonchus is heard with inspiration, and, if the child takes a deeper breath, with expiration. It is not evolved in puffs, and is not at all like the crepitation of pneumonia.

A senega and ammonia mixture was ordered, and the sinapisms were repeated, but the child died the next day in convulsions.

Unfortunately, no post-mortem examination was obtained, but there could be little doubt as to the nature of the case. The incomplete dulness limited to the right base behind, the weak breathing, combined with the severe general symptoms, and the absence of pyrexia, all these occurring in the course of a pulmonary catarrh, could only be due to collapse of the lung. The dulness was not found after the first visit, probably owing to the occurrence of local emphysema. The so-called "fits" were no doubt slight attacks of laryngismus stridulus.

CASE IV.—BRONCHITIS AND COLLAPSE OF THE LUNG IN A RICKETY CHILD.—Charles W., aged 1 year and 8 months, twelve teeth, was admitted into the East London Children's Hospital on December 13. "The child has been brought up partially by hand, and has been fed from birth with farinaceous food. Never had pertussis or measles. Has always been very subject to cough. Three months ago had an illness which was called choleraic fever.—His breath was very bad during this time, and he was much pulled down. Since then his chest has been 'falling in.' For the last few days he has had a very bad cough."

STATE ON ADMISSION.—Child very rickety. Head long from before back; fontanelle size of a florin, depressed; ends of long bones enlarged, but limbs generally straight; muscles excessively flabby and wasted; spleen and liver can be felt, of natural size, below false ribs; antero-posterior diameter of chest very long, and lower part of sternum very prominent; chest deeply grooved laterally at both sides, and the enlarged ends of the ribs are seen lying on the inner face of the groove; below the sixth rib the chest is much expanded laterally; the back is very flat in the scapular regions, and the spine at the lower dorsal region is curved sharply backwards. At each inspiration there is great recession of the chest-walls at about the level of the sixth rib, so as to give the appearance of a deep furrow extending across the body in that situation. Heart's impulse can be felt from the left side of ensiform cartilage nearly to nipple. At the right base behind, the percussion-note is very high-pitched as far as the lower angle of the scapula. Respiration there bronchial with subscrepitant rhonchus, and increased resonance of cry. In the right interscapular region the breathing is tubular, although there is no dulness.—

In the left interscapular region respiration is bronchial. Elsewhere on that side it is natural, and is accompanied over the lower two-thirds with subcrepitant rhonchus. There is no fulness on left side. In front the physical signs are perfectly natural on both sides of the chest. Temperature at 3 P. M. [illegible]°; pulse [illegible]; respiration [illegible]. At 9 P. M. temperature [illegible]°. The child was ordered a senega and ammonia mixture with five drops of vinum ipecac. every four hours; and twice a day the whole body was to be rubbed with the following liniment: ℞. Olei morrhuae [illegible]; olei terebinthinae [illegible]; linimenti saponis [illegible] linimentum.

*December* [illegible]. Looks very much better. Lying on back with head low and sucking all the fingers of his left hand. Less recession of chest-walls than was. Very little fulness at right base and respiration there loud and slightly blowing, with coarse subcrepitant rhonchus accompanying the inspiration. At lower angle of scapula and from that point to supra-spinous fossa diffused blowing respiration is heard, without rhonchus. At the left back percussion is perfectly natural; there is a little subcrepitant rhonchus at the left base, and at the angle of scapula the respiration is slightly blowing, although much less so than at right side. Respiration generally over both sides in front seems rather more bronchial than is natural, and vocal resonance rather increased. Temperature since last report has been almost uniformly [illegible]°; pulse [illegible]; respiration [illegible] to [illegible]. This morning, at 9 A. M.,—temperature [illegible]°; pulse 1[illegible]4; respiration [illegible]. Temperature at 9 P. M. [illegible]°.

*[illegible]th.* Percussion is now everywhere perfectly natural, but respiration is still rather more bronchial at right base than elsewhere, and in the right interscapular region diffused blowing. No rhonchus is heard about the chest except at right base, where there is an occasional clicking sound at the end of inspiration. Temperature at 9 P. M. [illegible]°.

After this the child went on well till December [illegible], when he had an attack of diarrhoea which lasted two days. He also began again to cough, and seemed very much weakened by the complication.

*31st.* Eyes rather sunken; cheeks flushed; lips white; cough loose. Percussion of back natural, but fine rhonchus is heard all over both backs, most marked at bases. Respiration in right interscapular region very blowing, as before. 9 A. M. Temperature [illegible]·2°; pulse 1[illegible]; respiration [illegible]. 9 P. M. Temperature [illegible]°.

*On January 1* face became very livid; he coughed a great deal and was very restless. Temperature [illegible]°; pulse 152; respiration 52. At night he slept, but not very quietly, and early on the following morning woke up with a scream and died almost immediately.

*Autopsy.*—Right lung slightly emphysematous at apex of upper lobe. The greater part of the upper lobe, the whole of the middle, and half the lower lobe deep purple in color, firm, shrunken, and non-crepitant, evidently in a state of collapse. Redness of the mucous membrane of larger bronchi, and many of the smaller bronchial tubes filled with plugs of thick mucus. In the left lung the posterior half of the upper lobe and part of the lower lobe also collapsed; the collapsed portions could be perfectly re-inflated. Right side of heart distended with black blood. Other viscera healthy.

In this case the child was the subject of profound rickets: the chest was much deformed, the ribs exceedingly soft, and the consequent difficulty of respiration extreme. In such a child on the occurrence of severe pulmonary catarrh collapse of the lung may, for reasons already explained, be confidently predicted. On his admission into the hospital the child was already suffering from partial collapse of the lower lobe of the right lung, as was shown by the dulness on percussion limited to the posterior region, and the bronchial breathing, combined with the low temperature. The blowing breathing in each interscapular region was not due to disease of the lung, but was the consequence of the flattening of the back in that situation, which approximated the large divisions of the bronchi to the chest-wall. This flattening, as was made evident by a section of the chest drawn from the cyrtometer, was especially marked on the right side, and at that point the respiration was excessively blowing, almost tubular in quality. Under the influence of treatment, and especially of the frequent application of a highly stimulating liniment, the bronchitis was relieved, the lung resumed its functions, and the urgent symptoms disappeared. Unfortunately, however, the child caught a fresh cold. Diarrhoea came on, which greatly reduced his strength; the bronchitis returned; and all the conditions tending to cause pulmonary collapse were again in full force. The inevitable result followed; both lungs became extensively collapsed, and the child died. The temperature in this second attack was rather higher (101°) than it had been during the first. This was no doubt due to the early stage of the bronchitis, which has the effect of at first elevating the temperature. That it was not owing to any pneumonic complication was shown by the perfect re-inflation of the collapsed portions of lung in the post-mortem room.

From the cases of collapse of the lung above narrated, it is evident that in young subjects the physical signs differ considerably from the signs which would be present in similar cases in the adult. In pulmonary collapse occurring in the adult the percussion note is slightly dull, vocal vibration and vocal resonance are diminished or annulled, and the breathing is suppressed, or is very weak, distant, and bronchial. Occasionally, when a deep breath is taken, a dry, minute, crackling rhonchus is caught faintly at the end of inspiration. In the child, on the contrary, and especially in the infant, sounds generated in the chest, owing to the small size of the thorax, are more readily diffused, and are conveyed with much greater distinctness to the ear. As a consequence, the intensity of the breathing, instead of being diminished, may even be increased;* so, also, the resonance of the voice may be stronger than natural, and, unless the collapsed portion of lung be very extensive, subcrepitant rhonchi generated in the immediate neighborhood may be heard clearly over the diseased spot. While, therefore, the diagnosis of pulmonary collapse in the adult is an easy matter, in the child its detection is more difficult, owing to the resemblance borne by the physical signs to those furnished by other diseases.

Dulness, bronchial breathing, a fine crepitating rhonchus, and increased resonance of the cry might, on a hurried examination suggest the presence of pneumonia or pleurisy. But the dulness is as a rule confined to the posterior base, and does not pass to the front of the chest as in pleurisy; the breathing never has the intense tubular quality so characteristic of pneumonia; and the crepitation, however fine it may be, is not evolved in puffs like the true pneumonic crepitus. The dulness is of a peculiar character, differing both from the incomplete dulness of pneumonia, and also from the dead, flat, toneless percussion-note of pleurisy. It is best detected by very light percussion with one finger, for, unless extensive, the collapse is limited to the surface, and does not penetrate deeply into the substance of the lung. When the collapse is symmetrical, and presents the pyramidal form which has been described, its detection is easy. When, however, it is confined to one lung the lesion is distinguished from pneumonia by the absence of tubular breathing and of true pneumonic crepitus. From pleurisy it differs by the very limited area occupied by the dulness, and by the fact that both the dulness and the sense of resistance are very much less than in cases where fluid is present.

Another and important distinguishing mark is furnished by the suddenness with which the signs occur. They appear and disappear with a rapidity which is not found in any other chest disease. But the diagnosis does not rest alone upon the characters of the physical signs. In all chest diseases, and especially in pulmonary collapse, it is important to take into account the general symptoms, and to compare these carefully with the signs furnished by physical examination, before arriving at a positive conclusion. The general symptoms come on at once, and are very characteristic. The distress, the lividity, the rapid shallow breathing, the faint cough, and the feeble cry—these symptoms occurring suddenly in the course of a catarrh, and, combined with the absence of pyrexia, leave little room for doubt as to the nature of the disease. The use of the thermometer is in these cases of the highest importance. In pneumonia the temperature is very high. In pleurisy it may be natural, but in that disease, unless the accumulation of fluid be so great as to render its presence evident to the most inexperienced observer, there is no distress, no lividity, no great hurry of breathing,—no signs, in fact, to indicate any difficulty in the passage of the blood through the lungs.

Diffused collapse of the lung, then, differs from pneumonia by the absence of pyrexia, the absence of tubular breathing and true pneumonic crepitus, and by the suddenness with which the physical signs occur. From pleurisy it differs by the limited area and imperfect character of the dulness, the smaller sense of resistance, and by the much greater severity of the general symptoms; for these could only occur in pleurisy in cases where the accumulation of fluid is enormous, and where the physical signs are consequently so characteristic as to remove any difficulty from the diagnosis.

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* A similar modification of the physical signs is seen in the case of pleurisy in the child, where, owing to the small area in which the phenomena occur, the physical signs may be very strikingly at variance with those to which we are accustomed in the adult. So great, indeed, is the difference, that any one unacquainted with the peculiarities of pleurisy in children would in all probability fail to estimate rightly the nature of the disease.

In cases where the pulmonary collapse is lobular, or where the lesion is not in contact with the chest-wall, the diagnosis must be made without any assistance from physical signs; but here, if many isolated lobules are involved, the very absence of physical signs supplies an important indication. The general symptoms which have been enumerated occurring suddenly in the course of a pulmonary catarrh, and without giving rise to any special physical signs by which they may be accounted for, suggest at once the presence of lobular collapse of the lung. In catarrhal pneumonia, where special physical signs are also often absent, the temperature is elevated, and the breathing excessively laborious; while in collapse the temperature is not elevated, and the breathing, although rapid, is shallow and quiet.

It is not always easy in cases of bronchitis to decide upon the presence or absence of accompanying lobular collapse; but in such cases collapse may be suspected if, with only moderate bronchitis and a normal temperature, the general symptoms are grave out of all proportion to the physical signs, or if, where the bronchitis is severe, the breathing changes from the laborious respiration of intense capillary bronchitis to the shallow, rapid breathing so characteristic of pulmonary collapse, while at the same time the lividity and general distress become still further aggravated, and the temperature remains low. If convulsions occur towards the end of an attack of bronchitis, it is probable that collapse of the lung has taken place.

The treatment of pulmonary collapse consists in the adoption of means to increase the force of the inspiratory act, both by compelling the child to exert to its full extent the power he may possess, and also by adding to that power as much as possible, so as to effect a dilatation of the exhausted air-cells. In the first place, we must take care that there is no mechanical impediment to the expansion of the chest. The dress should be loose, and the child should be placed in such a position as to insure free movement of the thoracic walls. Thus, if the lesion be limited to one lung, the patient should be laid upon the back, inclining to the sound side. We should next adopt mechanical means for deepening the breathing. After certain acts, such as crying or vomiting, a deep breath is instinctively taken. It is therefore advisable to make the child cry by rough friction to the soles of the feet, or by the sudden application of a sponge dipped in cold water to the naked chest. The emetic should be one which acts quickly without producing much depression, such as oxymel of squill or one or two drachms of alum in syrup. Either of these may be given, and they will have the further advantage of dislodging and expelling some of the mucus which loads the air-tubes. If the feet are cold, they should be warmed by the application of a hot bottle; and the same may be applied, if necessary, under each arm as the child lies in his cot. For increasing the child's inspiratory power, stimulation, both external and internal, is required. A highly stimulating liniment may be made by adding two drachms of oil of turpentine to four ounces of compound camphor liniment, or the linimentum ammoniæ of the Pharmacopœia may be used. Either of these should be well rubbed into the chest and back two or three times in the day. For internal administration the stimulating expectorants should be employed, especially carbonate of ammonia, senega, and squill. Four grains of quinine dissolved in half an ounce of sal volatile make a powerful diffusible stimulant, of which a few drops may be given frequently in a teaspoonful of milk or water. Five or ten drops of pale brandy may be given occasionally in addition. If the child be drowsy, he should not be allowed to sleep too long at one time, but he should be occasionally roused, so that some of the preceding measures may be adopted. The diet should consist of milk with (if the child be old enough) strong-beef-tea. In bad cases, where there is difficulty of swallowing, the brandy-and-egg mixture of the Pharmacopœia, given at intervals with a teaspoon, is very useful. By the energetic use of the above measures very surprising results are sometimes obtained. But their employment must be energetic and immediate: no time must be lost, or the opportunity for successful interference will have passed away.

## CHAPTER III.—CROUPOUS PNEUMONIA.

CROUPOUS pneumonia not common under two years of age—Symptoms and physical signs.
Case V.—Pneumonia introduced by a convulsive attack.
Case VI.—Pneumonia of apex with severe cerebral symptoms (cerebral pneumonia)—Comment.
Case VII.—Pneumonia of apex without cerebral symptoms.
Case VIII.—Pneumonia complicated by gastro-intestinal catarrh—Comment
Case IX.—Rapid resolution of pneumonia of the apex.
Diagnosis of croupous pneumonia—Treatment.

CROUPOUS pneumonia is a comparatively infrequent disease under the age of two years. It attacks any part of the lung indifferently, and is found much oftener than happens in the adult at the apex; indeed, the younger the child the more likely is the apex to be attacked. These cases of pneumonia of the apex are sometimes accompanied by special symptoms, as will be afterwards seen.

The ordinary course of a case of primary croupous pneumonia is the following :—

A child who is apparently in his usual health stops in his play, and, saying he is tired, asks to lie down. He then becomes thirsty and feverish, and usually vomits. In a few hours or the next day he begins to cough—a short, hacking cough; his bowels are confined, his tongue is thickly furred, and he often complains of headache. The cough is generally accompanied by some pain, for, if old enough to speak, the child will often complain of pain in the side or belly, or will show by the distress in his face that the cough is painful to him. If the temperature be taken within a few hours of the attack the thermometer is found to mark 103° or 104°, or even higher, and it retains this level, with slight morning intermissions until resolution takes place, when the mercury falls as abruptly as it rose, and generally remains for some days afterwards at a level below the ordinary temperature of health.

At the same time that the cough is first heard the breathing begins to be hurried, and the nostrils dilate at each inspiration. The breathing is quickened out of proportion to the pulse; and it is important to notice this point, because the altered relation between the pulse and the respiration is a valuable diagnostic sign, and when present with a high temperature would lead us at once to suspect the nature of the complaint. Instead of one breath to every four beats of the pulse, which is the ratio of health, there is one to three, or even sometimes one to only two. This symptom is especially useful because it occurs early, and at a time when there may be no physical signs about the chest to lead us to a conclusion, About twenty-four hours after the first seizure the child is seen with flushed cheeks, burning skin, and red dry lips, which have often a patch of herpes. His breathing is quick, and its rhythm is often altered, the pause taking place at the end of inspiration instead at the end of expiration. With each inspiration his nares dilate widely. At frequent intervals he coughs a short hack, or has a succession of short hacks, which may last without intermission for five or ten minutes, leaving him pale and exhausted. The pulse is quick, varying from 130 to 150, and is often very unequal in the force of its beats, sometimes actually intermittent. The respiration is 50 or 60 in the minute, or even higher. But there is this peculiarity with regard to the breathing, as compared with the respiration of bronchitis, or of the other form of pneumonia called catarrhal pneumonia—viz., that however quick it may be, and however distinctly the lividity of the mouth and eyelids may prove the insufficient oxidation of the blood, the breathing is never laborious. None of the accessory muscles of respiration are brought into action; in fact, in the true sense of the word there is no dyspnœa. If there be much pain in the side the breathing is especially shallow, and Traube has attributed its rapidity partly to this cause and partly to the influence of the high temperature of the blood upon the nervous centres, for its quickness is found to be diminished by the application of cold. Still, although the child does not exhibit any profound consciousness of distress from the interference with the function of the lungs, yet he distinctly shows that his volition is now concerned in the act of respiration, and that the supply of air to the chest requires all his attention. If an infant, he sucks hurriedly, stopping every now and then to breathe with open mouth, as the nasal passages can no longer admit air in sufficent quantity to the lungs.

Under examination, too, he is quiet and docile, submitting himself without resistance to be percussed and ausculted, for he feels that crying and struggling would still further hurry his breathing, and this he cannot afford. This passiveness during examination of the chest is a valuable sign, and is diagnostic of some interference with the function of respiration, whether that interference be due to disease of the lung, as in bronchitis and pneumonia, or of the chest-walls, as in rickets. In any case where an infant screams loudly during an examination of the chest, the probabilities are strong against the lungs being seriously diseased.

An older child lies quietly in bed, resting on his back or side. He takes little notice of what is going on around, and often refuses to answer the questions which may be put to him, for cases of pneumonia are distinguished by great muscular prostration, when all exertion becomes troublesome.

Examination of the chest does not at once reveal signs of lung consolidation. For the first day or two there may be no dulness, and by the stethoscope we may only hear weak or harsh breathing, if, indeed, the respiration be not perfectly natural. There is almost always sonoro-sibilant rhonchus diffused more or less widely over the lung. It is often not until the third day that positive signs of solidification can be detected, and even these may not all appear together. Thus, if the inflammation begins in the centre of a lobe, we may get bronchial breathing, with a puff of fine crepitation at the end of inspiration, but, should a layer of healthy lung-tissue intervene between the diseased spot and the chest-wall, there may at the same time be no dulness on percussion with one or even with two fingers. It is always important, as has been before remarked, to strike with two fingers as well as with one in examining the chests of infants and children. Percussion with one finger alone often yields negative results, when the use of two fingers will at once reveal the existence of dulness; and this practice is of especial importance in the disease under discussion, for in pneumonia the dulness is often far from being complete, and may easily escape notice if one finger only be made use of.

The sequence of the physical signs is much the same in infants and children as it is in the adult. At first the percussion is normal, and the respiration either natural or weak and harsh, accompanied by sonoro-sibilant rhonchus. In a day or two the percussion-note becomes more or less dull, with slightly increased resistance, the respiratory movements of the affected side are hampered, and the intercostal spaces sink in during inspiration. The respiration is weak or harsh or slightly bronchial, and fine crepitation is heard at the end of inspiration. The crepitation is perhaps coarser than the same sign as it occurs in the pneumonia of the adult, but its coarseness has been much exaggerated. At this period there is often a bronchitic subcrepitant rhonchus heard both with inspiration and expiration, and this, in ordinary gentle breathing, is all that can be distinguished. It is only when the child takes a deep breath, as he occasionally does after a fretful whine or after a cough, that any true crepitation is heard at all, and then a puff of the true pneumonic crepitus can be caught at the end of the inspiration, and is found to differ little in its character from the same crepitation so familiar to us in the pneumonia of the adult.

The dulness then becomes more complete, the sense of resistance is greater, the crepitus ceases to be heard in the affected part, although it may still be detected at its confines, and the respiration assumes that intense sniffling, metallic character which is called tubular breathing; at the same time the voice of the child, or, in an infant, the cry, is conveyed with unnatural distinctness to the ear.

The situation of the physicial signs is important. They may be found, as has been said, at any part of the lung—at the apex as often as at the base—or may be seated at some part of the middle lobe. As a rule, however, they are limited—at any rate at first—to the posterior regions of the thorax, and unless the inflammation occupy the apex of the lung, are rarely to be detected in front. This is valuable, as serving to distinguish this disease from pleurisy, which it so much resembles, and with which it is so often confounded.

The physical signs, after persisting for a variable number of days, begin gradually to subside; and in a typical case of pneumonia the order of the changes is as follows:—Crepitation first returns, coarser and more distinctly bubbling than before. The respiration then becomes less sniffling, and gradually loses its bronchial quality. The dulness also diminishes, and finally disappears. The cry remains too resonant for a considerable time, persisting so long as there is left any dulness on percussion; and for some days a fine bubbling rhonchus, the remains of the redux crepitation, is heard at the affected part. The above phenomena are not, however, constant. Resolution is often marked by no returning crepitation, and the consolidation may be removed without other rhonchi than ordinary dry sonoro-sibilant rales being at any time detectable. This, indeed, is far from being an uncommon circumstance. The dulness is also sometimes very slow to disappear, and for many days, and perhaps weeks, after the return of normal resonance, the breath-sounds may be harsh and feeble at the affected part, and may only gradually reassume the characters of health.

The symptoms during the course of the disease undergo little change. The child usually wanders a little at night, and starts and moans in his uneasy sleep. He seldom cries, having no breath to spare for noisy lamentations, but he sometimes emits a kind of grunt or moan at the end of each inspiration, which has been said by some writers to be characteristic of the disease. The flush on the face generally disappears after a few days and the cheeks remain pale, while the eyelids, lips, and sometimes the tips of the fingers, become livid. The urine is scanty, and is thick from lithates; it contains a large amount of urea, but little chloride of sodium, and there is often a trace of albumen. In many cases, however, the termination of the stage of exudation is marked by an evident improvement in the general condition of the child; for although the temperature does not fall, yet certain changes, slight in themselves, are noticed at this time, showing that the destructive stage, if it may be so called, is at an end, and that recovery is shortly to begin. The expression of distress passes away, the child is less absorbed in his own sensations, loses his preoccupied look, and begins to take some interest in what is passing around him. The first symptom indicating that resolution has begun in a sudden fall of the temperature, which sinks to a level below that of health, and the thermometer often marks only 97.6° in the rectum. This fall generally precedes by about twenty-four hours, or even longer, any improvement in the physical signs. At about the same time the cough, which for some days had been less hacking, becomes quite loose, and there is often a profuse general perspiration. The pulse and respiration diminish in frequency, and return to their natural relation to one another. This change takes place in most cases on the fifth or seventh day, unless more than one lobe of the lung has been involved in the inflammation, in which case the crisis may be delayed until the eleventh, twelfth, or thirteenth day. The child is left very pale and prostrate, but the appetite quickly improves, and unless a relapse takes place the patient soon regains his flesh and strength.

The above is the usual course of a case of simple primary croupous pneumonia, but we occasionally meet with variations in the symptoms which it is important to be acquainted with, as they may obscure the diagnosis.

The disease is sometimes ushered in with convulsions; and this is not a very uncommon mode of beginning. The convulsions may last for several hours, the child passing from one fit into another. The cases where this symptom occurs need not be of unusual severity, nor is the evolution of the disease necessarily marked by any other sign of cerebral disturbance. The convulsions generally cease after a few hours, and the disease runs its usual course without any return of the fits, and without the occurrence of any circumstance calculated to excite unusual anxiety.

### CASE V.—PNEUMONIA INTRODUCED BY A CONVULSIVE ATTACK.

William A., aged 5 years, was seized with convulsions on November 28, which lasted for a quarter of an hour, and left him in a half-conscious state for several hours afterwards. He was seen on December 1, lying in bed with a flushed face, intensely hot skin, and loaded tongue. His bowels had been confined for two days, and he complained of frontal headache and of pains about the chest and belly. The pulse was 140, and the respiration 75. He had a frequent dry hard cough, and the nares acted with each inspiration. His nose had bled shortly before the visit. On examination of the chest, resonance was normal, and the respirations appeared quite natural both at the back and at the front.

On the next day, December 2, there was incomplete dulness at the right back, with bronchial respiration and some crepitation; the pulse was 138; the breathing was rapid, but could not be taken on account of irregularity from straining and sighing. He wandered at night, and lay dozing during the day. There were sordes on the lips, and his face was pale, with a tendency to lividity; but still he lay back in bed without any manifest oppression of his breathing. In this case the temperature fell on the seventh day, and at the same time redux crepitation was heard at the back. On the sixteenth day examination of the chest showed no signs of disease, and the child was pronounced convalescent.

The epistaxis which occurred on the third day in this child is to be noted, because it is a symptom which is sometimes found early in the disease, and is stated to be also occasionally seen at the period of resolution. The course of the disease was mild: the pneumonia was limited to one side, and the initial convulsion did not exercise any unfavorable after-influence upon the case.

In some instances the convulsions do not cease as the disease becomes developed, but are repeated again and again. They may be accompanied by other symptoms indicating disturbance of the brain, or on the other hand, cerebral symptoms may occur without being preceded by convulsions. In such cases there is often little in the appearance of the child or in the history of his attack to draw attention to the chest at all, but instead we find violent headache, vertigo, delirium, and stupor—symptoms all pointing to cerebral lesion and distracting our attention from the real seat of disease. On account of the predominance of brain symptoms, this form of inflammation of the lung has been called "cerebral pneumonia." It is often extremely perplexing to the practitioner, who, without a careful and thorough exploration of the lungs, is unable to quiet the natural alarm of the parents, for as the apex of the lung is commonly the part attacked, the real nature of the disease may be easily overlooked unless the whole of the chest be subjected to examination.

The following is a good instance of this form of pneumonia:—

### CASE VI.—PNEUMONIA OF APEX WITH SEVERE CEREBRAL SYMPTOMS (CEREBRAL PNEUMONIA).

Ellen S., aged 2 years and 8 months, a fat, robust-looking child, after ailing for a week, began to be feverish, and had a slight cough. She was very restless at night, twitching, and sometimes starting up from her sleep with a scream. She refused food, but constantly required drink. Since the beginning of her illness she is stated to have suffered much from vertigo. While lying or sitting on her mother's lap she would suddenly clutch at her mother's neck or dress, and exclaim she was falling. This, for two days before the visit, had been a very prominent symptom. The child was first seen on the morning of February 4, three days after the cough had been first noticed. "Looks ill; nares not acting; face not flushed, but is said to flush at times, and then to turn pale. Pressure on forehead produces no vivid redness, and when the finger-nail is drawn along the cheek a reddish line appears slowly, and is not brighter in color than is compatible with health; muscles of face twitch. Tongue rather dry; and covered with a thick layer of yellowish white fur. Skin feels hot to hand. Temperature in axilla before examination of chest, 101.8°. Pulse 156, irregular in force, but not in rhythm: it was difficult to take, on account of subsultus tendinum. Respirations regular and not hurried. Belly not retracted, rather full, if anything, and seems a little tender; bowels confined two days; has not vomited during whole time of present illness."

On examination of chest no dulness was found anywhere—back or front, and with the stethoscope respiration appeared to be natural, and nothing abnormal was found but a little sonoro-sibilant rhonchus here and there over both lungs. During all the time of examination the child kept up a constant scream, and, when the examination was concluded, lay drowsily back with closed eyes in her mother's arms. A rhubarb and jalap powder was ordered, with a saline mixture.

On February 8 she was seen again. "Ever since last visit has been lying in a dreamy state, with eyes half closed and dim-looking, taking no notice of anything that passed. Yesterday, however, she cried once or twice to be nursed, which she had not done before. Is now (10 A. M.) lying in her mother's lap apparently half stupefied. The eyes are half closed, showing the whites. When forehead is pressed she looks up, and appears as if about to cry, but closes her eyes again almost immediately. No very positive redness produced by pressure on forehead or cheek. Lips still twitch; and yesterday her mother thought the child was going to have a fit, she twitched so much. Is said sometimes to squeal out sharply. Does not squint. Vertigo still continues, for child seems to be occasionally afraid of falling. Temperature in axilla, 101°; pulse, 152, very intermittent in force and rhythm. Tongue thickly furred and rather dry. There has been no sickness, and the bowels act every day. The child has still a little cough, and seems rather hoarse." Unfortunately, the chest was not examined on this visit, principally from a wish not to disturb the child unnecessarily. She seemed exceedingly ill, and her case was strongly suspected, in spite of the contradictory symptoms, to be one of tubercular meningitis. Some calomel powders were ordered.

On the next visit, February 11,—"Until yesterday the child 'lay as if dying, with hands drawn up.' Since then has been very fretful, asking constantly for drink, and moaning and whining. Eyes now bright. Pulse excessively intermittent in force and rhythm; can't be counted from restlessness. Has not squinted. Bowels, since taking the powders, have been opened two or three times a day; motions green and slimy. Is hoarse; coughs a great deal; and there is some rattling of phlegm about the chest. Retches sometimes after the cough, but she has not vomited all through the course of the disease. Temperature in axilla before examination of chest, 99.4°. Percussion of the right back showed dulness from the supraspinous fossa to halfway between the spine and the lower angle of scapula; respiration there very bronchial and almost tubular; no crepitation; vocal resonance increased." A draught containing ipecacuanha wine and sal volatile was ordered every few hours.

On February 15,—"Child has been improving since visit: has been more lively. Bowels have acted about every other day; motions dark and offensive. Is still hoarse, and requires much drink. At night is fretful, but in the daytime lies quietly enough if nursed. Appetite very bad. Temperature in axilla, 99°. Pulse can't be counted on account of restlessness. There is still dulness at right back, as before. The child cries loudly all the time of examination, and the transmitted hoarse laryngeal breathing makes it impossible to tell the condition of the respiration." Half a grain of quinine was ordered three times a day.

After this date the appetite became good, and the child very rapidly improved; on February 25 there was little evidence of consolidation left at the supraspinous fossa.

Although cases of pneumonia complicated with cerebral symptoms are almost always those involving the upper part of the lung, it by no means follows that inflammation of the apex in a child will be necessarily accompanied by such symptoms. It is not at all uncommon, as has been before stated, for pneumonia to attack the upper part of the lung in children without there being any reason to suspect the existence of tubercle or caseous deposit: and neither in its course nor termination does inflammation present, as a rule, any deviation from the ordinary phenomena of the disease. The symptoms and physical signs are those common to pneumonia, and the deposit afterwards clears away as completely as if any other part of the lung had been involved.

In the above case there was little to draw attention to the chest. Instead of flushed cheeks, active nostrils, rapid breathing, and frequent hacking cough, the face was pale, the nares were motionless, the cough slight, and the breathing quiet; while the vertigo, the twitching, the marked drowsiness persisting for seven days and becoming intensified into something approaching to stupor, all seemed to point to the existence of cerebral lesion. In spite, however, of the symptoms, there were many points of distinction between this case and tubercular meningitis, for which it was almost mistaken. The short duration of the premonitory symptoms, in the first place, argued against such a supposition; for although tubercular meningitis occasionally begins with suddenness, yet it is usually preceded by gradual loss of flesh, color, and spirits, with slight feverishness, constituting a *malaise* which persists for several weeks before any regular symptoms of the disease are noticed. Again, the disease was not ushered in by sickness, and the constipation was slight and easily removed by an ordinary aperient; the pulse was rapid, while during the earlier periods of tubercular meningitis it is generally slow; the abdominal wall was not retracted; the respiration was regular, without sighing or the occasional pauses which are so marked a feature in the cerebral lesion; there was no flushing on pressure of the skin, no squinting or irregularity of pupils; and the child, although there is no sign of apparent unconsciousness, could be easily roused.

Mere irregularity of pulse is of absolutely no value as a means of diagnosis. In any febrile attack the pulse of a young child may become irregular in [illegible]; in many cases the mere commencing of the early action seems to disturb the regularity of its contractions. But while a quick irregular pulse is of little consequence, a slow irregular pulse [illegible] a different meaning, and if suspicions of tubercular meningitis have been already excited, will go far to convert those suspicions into certainty.

The degree of heat of the skin, which the [illegible] for inflammation of the lung, would rather [illegible] of [illegible]. [illegible] must be remembered that the child was seen in the morning, when the temperature of pneumonia falls to a certain extent. If I had seen [illegible] in the evening the thermometer would no doubt have been found to mark as high as 103° or 104°. Again, the [illegible] of the child under examination rather opposed the notion of pulmonary lesion. But in cases where the pneumonia attacks the apex, a child is usually found to be less tractable than when any other part of the lung is the seat of inflammation. In health the apices are less freely expanded in ordinary respiration than are the other parts, on account of the deficient movement of the chest-wall in the superior region; and therefore in disease the patient suffers less from the temporary inability of a part which takes naturally only a moderate share in the respiratory function.

Instead of a pulmonary lesion we might in this case have been inclined at the first to suspect the existence of [illegible]. But the continuance of the stupor, and the absence of any more special symptoms, soon excluded this idea.

In the following example the pneumonia was also seated in the apex of the lung; but no cerebral symptoms were present, except some slight delirium, which is common enough in all acute febrile diseases in the child:—

CASE VI.—PNEUMONIA OF APEX WITH NO CEREBRAL SYMPTOMS.

Eliza L., aged [illegible] years, was admitted into the East London Children's Hospital on October [illegible]. Three years before, she had had an attack of measles, from which she soon recovered; and twelve months before, had been seized with scarlatina, which was followed by dropsy, and she was ill for two months. On October [illegible] the child shivered, lost her appetite, and complained of pains about the limbs; she then became feverish, and had a dry cough, which she said hurt her chest. The bowels were also relaxed, with offensive motions. On the night immediately preceding her entrance into the hospital the child was said to have been slightly delirious. The urine was examined shortly after admission, and was found to contain a trace of albumen; specific gravity 1015; slightly acid.

State on admission.—Child in good condition, [illegible]. Cheeks flushed, lips dry, [illegible] slightly [illegible] hot to hand, and very dry; tongue covered with thick white fur, and rather dry. Percussion-note is slightly deadened in front at the right supraspinous fossa, without being actually dull. Respiration at that spot with mouth open is bronchial. Vocal resonance increased. Percussion at the right infraclavicular region is perfectly natural, and there is no dulness of the chest in front; but below the clavicle and extending downwards into the mammary region a coarse rubbing or creaking sound is heard with inspiration, which, when the child takes a deep breath, has rather a puff character. In the right axilla the percussion-note is clear, but the respiration is tubular, with increased vocal resonance. Some crepitation is heard at the lower part of axillary region. Temperature 105.[illegible]°; pulse 1[illegible]; respiration [illegible].

The percussion-note became soon afterwards completely dull at the right supraspinous fossa, but the breathing there was never more than bronchial. In the axillary region, on the contrary, the percussion-note was throughout perfectly natural, while the breathing remained tubular until resolution took place. The coarse creaking over the front of the chest was not noticed after the first day. The temperature fell on the evening of October [illegible] to 100.[illegible]°, the pulse to [illegible], and the respiration to 32; and on the morning of October [illegible] the temperature was [illegible]°. From that time it remained normal. On October [illegible] the physical signs were as follows:—Slight dulness at right supraspinous fossa; respiration there harsh, without crepitation; respiration in axilla bronchial, with only faint tubular quality, accompanied by subcrepitant rhonchus.

In this case the pneumonia was very limited, only a small part of the upper lobe being attacked. The absence of dulness in the axilla was no doubt due to a thin layer of healthy tissue intervening between the inflamed portion and the surface.

There is another symptom sometimes found to accompany the development of inflammation of the lung, which may be a cause of much difficulty in the diagnosis. This symptom is gastro-intestinal catarrh. The following short note of a case may be useful to illustrate this complication:—

CASE VIII.—PNEUMONIA COMPLICATED BY GASTRO-INTESTINAL CATARRH.

Caroline H., aged 11 years, was taken ill on the evening of December 26, with frontal headache and vomiting of bitter fluid. Her skin was hot, she was very thirsty, had no appetite, and complained of feeling very ill and weak. On the following day (December 27) her bowels became relaxed, and acted four or five times before the evening. She remained in this state till December 30, when I first saw her.

"Complains of frontal headache; skin intensely hot; tongue moist and covered with whitish fur, through which red papillæ project. Is very thirsty, and complains much of weakness; wanders at night, and got out of bed last night while delirious. Bowels acted five times yesterday; motions dark-colored and slimy. Says some tenderness when pressed in left iliac fossa, and there is gurgling there and on the right side. She coughs a good deal, but lungs on examination appear quite healthy." Small doses of acetate of lead and opium were ordered.

On January 1,—"The diarrhœa was better, although the bowels had acted twice previous to visit. Pulse 128; skin still intensely hot; wandered less last night, but cough was very troublesome and prevented her sleeping. Complains of great pain in left hypochondrium. There appears to be some want of resonance at both bases posteriorly; respiratory sounds a little harsh on left side, and sonoro-sibilant rhonchi are heard over back."

On January 3,—"Bowels have not acted since last visit. Pulse 120, full but compressible, regular. The patient seems a little delirious; she talks loudly, describing her symptoms, with a peculiar ringing lengthening of the termination of her words. Pupils dilated, eyes glistening. Complains of pain at the top of her head and in the left side of her chest, which last she compares to 'knives and forks' sticking into her. Tongue still furred; cough very troublesome; skin still very hot. She was very delirious last night; tried to get out of bed, and talked wildly. No tenderness about abdomen, which is not at all swollen, and there is no appearance of eruption either there or at the back. On examination of back there is dulness of left base reaching up to the angle of scapula, with bronchial breathing, a little subcrepitant rhonchus accompanying both inspiration and expiration, and fine crepitus at the end of deep inspiration. Vocal fremitus is increased. In front of left side no physical signs are found."

On January 5 (the ninth day) the pulse had fallen to 80, and the heat of the skin, as tested by the hand, seemed very much diminished. She slept well, was not delirious, and altogether seemed very much better, although very weak. On the next day (January 6) the chest was covered with sudamina, and on January 7 redux crepitation was heard all over the affected lung. She then became rapidly convalescent.

In this case the frontal headache, the diarrhœa, and the tenderness of the abdomen, combined with fever and delirium, might have given rise to suspicions of typhoid fever; but the mode of beginning of the two diseases is very different. Primary lobar pneumonia begins suddenly, the child passing abruptly from health to sickness; typhoid fever, on the contrary, begins slowly, and is always preceded by some days of languor, slight feverishness, and feelings of general discomfort. Again, in the present case the girl was light-headed almost from the first, and on the second night after the attack, attempted to leave her bed while in a state of delirium. In typhoid fever the delirium begins later, and is seldom found before the end of the first week. Besides these two very important points, the prominence of the cough from the first, and the altered relation between the pulse and respiration, would lead us to expect the occurrence of the characteristic physical signs of lobar pneumonia. Later, the non-appearance of the spots, which are seldom absent in a child of 11 years old, and the early convalescence,—for in typhoid fever the temperature rarely falls before fourteen days have elapsed,—confirmed the diagnosis.

There is one other symptom which is mentioned by MM. Rilliet and Barthez as occasionally accompanying the onset of pneumonia. This is a general redness. It appears to be an extension to the whole body of the flush which in cases of inflammation of the lung, usually overspreads the cheeks. It is well to be aware of this symptom, for the redness has been mistaken for scarlatina, although its rosy tint would scarcely mislead an attentive observer. It is not a common phenomenon, and I do not remember to have met with a case in which it occurred.

Although the fall of temperature usually takes place on the fifth or seventh day, yet it is occasionally, as has been said, deferred to a later date. This postponement of resolution is often found when a large tract of lung has been involved in the inflammation. Sometimes, however, the prolongation of the pyrexial period is due to the invasion of successive tracts of lung, and when this occurs, the temperature, instead of retaining nearly the same level through the disease, undergoes occasional exacerbations, each of which is followed by a slight fall, so that the pyrexia may appear to be intermittent. Sometimes a period of several days will pass between the first fall of temperature and its after-rise; in these cases a relapse is said to take place when the new portion of lung becomes invaded, but this second attack seldom lasts so long as the first, and the temperature usually falls again on the third or fourth day.

Simple primary pneumonia in infants and children almost always terminates favorably. As a rule, resolution takes place early, and the deposit clears away completely, leaving the lung as healthy as before the attack. Sometimes, however, some unabsorbed deposit may be left, but this is much more common with secondary pneumonia than when the inflammation is primary. The seat of the inflammation in the lung does not, according to my own experience, exercise any influence upon the prognosis—indeed, pneumonia of the apex, which has been stated to be so dangerous a form of the disease, often runs an especially mild course.

### CASE IX.—RAPID COURSE OF PNEUMONIA OF THE APEX.

Thomas F., aged 4 years, a strong-looking, fat boy, was taken ill on May 25. He complained that he felt tired, and wanted to lie down. He was thirsty, and vomited directly after drinking. In the night he was very feverish, and coughed a great deal.

He was seen on May 28. "Face flushed; nares acting; has frequent hacking cough; tongue furred; and bowels confined. Respiration 44; pulse 128, very irregular; temperature in axilla, 104.3°. Examination of chest shows dulness at right apex, principally at the supraspinous fossa, where the breathing is tubular (with the mouth open); vocal resonance is unusually strong, and there is a little subcrepitant rhonchus, but no true crepitation. In front there is only slight dulness at the supraclavicular region, and the respiration is bronchial." In this case the temperature fell on May 30 (the fifth day); and on the following day,—"Skin quite cool; respiration natural, and not quicker than ordinary. A little dulness left at right supraspinous fossa, but respiration merely harsh, and there is a little subcrepitant rhonchus with both inspiration and expiration."

In this case there is nothing unusual. It is a good example of the ordinary course of pneumonia of the apex, such as may be seen every day, during the changeable seasons of the year, in the out-patients' room of a children's hospital.

When the inflammation of the lung occurs secondarily to some previous illness, the prognosis is often serious. A secondary pneumonia differs from a primary by its slower course (for resolution is often considerably delayed), and by its greater tendency to end in chronic disease. Besides, if the child has been much reduced by the previous complaint, the earlier symptoms are often rendered obscure. The consequences resulting from a pneumonic consolidation remaining unabsorbed will be discussed in another chapter. (*See* Chapter VI.)

The diagnosis of croupous pneumonia after the physical signs have appeared, is not difficult. The dulness, incomplete as a rule, with no very great increase in the sense of resistance; the intensely tubular breathing; and the resonance of the cry—these signs, heard principally posteriorly, and only in a very limited degree at the front of the chest, are very characteristic, especially when combined with the extremely elevated temperature and the altered relation between the pulse and the respiration. Before, however, the physical signs have appeared, the diagnosis is not so easy. In the case of any sudden acute attack, a perverted pulse-respiration ratio, with active nares, without any chest symptoms sufficient to account for the rapid breathing, should always lead us to suspect pneumonia. But we must not found a diagnosis upon these symptoms alone. In pyrexia from any cause in young children the breathing is hurried, and the nares may even act. Besides, sudden elevations of temperature are not uncommon in infants from very trifling causes. A short, hacking cough added to the above symptoms greatly increases the probability that pneumonia is the disease with which we have to deal. In bronchitis the temperature is lower, and the existence of such symptoms would be accompanied by the presence in the chest of abundant liquid bubbles; while, in the case of inflammation of the lung, rhonchi, if present, are merely of the sonoro-sibilant variety, and are scanty and rare.

No mention has been made of vocal vibration of the chest-wall—a sign which is so valuable in the adult—because in children the preseuce of chest fremitus is very uncertain, and cannot be relied upon. In some children it may be completely absent from both sides of the chest. In others it is absent from the sound side, but is felt faintly over the affected lung. In other cases, again, the vibration of the chest-wall has seemed to be actually diminished on the diseased side as compared with the opposite half of the chest. In cases where a fremitus is felt *only* over the diseased side, the sign is an important one, and points distinctly to consolidation.

There is a certain combination of symptoms which might prove embarrassing to a beginner. Thus, if a child be suffering from slight bronchial catarrh, and at the same time be feverish from cutting a tooth, the temperature may reach 104°, or even higher, and this, with hurried breathing and a quick pulse, might give rise to strong suspicions of pneumonia, particularly as on examination of the chest nothing might be found but a little dry, wheezing rhonchus. In such a case, however, the pulse-respiration ratio would be little perverted. The character of the cough, too, which has not the short hacking quality so characteristic of inflammation of the lung, would be a valuable distinctive sign, and one which should make us search further for a cause of the pyrexia. This would be at once discovered by an examination of the mouth, and the history of the attack would remove any remaining hesitation as to the nature of the ailment.

In cases of cerebral pneumonia, such as that previously narrated, a diagnosis is impossible before the physical signs have appeared, and even then the real nature of the disease is often overlooked, owing to the character of the symptoms distracting our attention from the chest. In all cases of acute febrile disease the chest should be thoroughly examined, and, so long as the diagnosis remains uncertain, the examination should be repeated daily until some positive conclusion is arrived at.

The diagnosis between pneumonia and pleurisy will be considered in treating of the latter disease.

Primary croupous pneumonia requires little medicine: the treatment should be rather directed to ward off disturbing influences than by injudicious meddling to interfere with the course of a disease, the tendency of which is to recovery. The days of venesection are fortunately gone by; and although the local abstraction of blood by leeches or a cupping-glass is usually recommended in systematic treatises under certain contingencies, yet in practice it is found that these contingencies, when they occur, generally bring with them some modifying influence by which the necessity for bloodletting is spared. I have never attempted to draw blood from a child suffering from pneumonia, nor have I ever met with a case in which such a method of treatment has appeared to me to be in the slightest degree desirable. Great difficulty in the passage of blood through the lungs (as shown by a small feeble pulse, with violent action of the heart, accompanied by lividity and very rapid breathing), and a high elevation of temperature, have been held to indicate the necessity of bleeding; but it is now generally allowed that such treatment affords only temporary relief, the symptoms returning after a few hours with all their former severity; and, on the other hand, it is undeniable that the critical fall of temperature is thereby hindered and convalescence delayed. Antimony, again, which used to be given in such large doses, causing extreme depression, is not to be recommended for children. Small quantities of the vinum antimonialis may be given, if thought desirable, on account of its diaphoretic action, but the use of the drug in doses sufficiently great to reduce the strength, is to be carefully avoided.

The patient should be placed in as airy a room as possible, and this should be well ventilated and should not be kept too hot. Some febrifuge medicine may be given, such as liq. ammon. acetatis, with citrate of potash, so as to favor the action of the skin, and this object is aided by the addition of five or ten drops of ipecacuanha or antimonial wine to each dose of the mixture. The affected side must be kept constantly covered with large hot linseed-meal poultices. These poultices must be made large, so as to overlie a sufficient extent of surface, and they should be thick, so as to retain the heat as long as possible. They can be changed every two hours. Instead of poultices, Vogel recommends tepid compresses, which are applied in the following way: —A napkin, folded into a band of about three or four inches wide, is wrung out of tepid water, and is applied like a girdle round the chest of the child. This is covered by a piece of gutta-percha sheeting, and over the whole is placed a second napkin, dry and warm, and folded broader than the first, so as to overlap its edges. The dry napkin is to be changed several times a-day, but the damp cloth must be kept constantly in position, and can be rewetted every few hours by pouring upon it a few teaspoonfuls of tepid water, raising up the edge of the gutta-percha sheeting to do so. The tepid water soon gets heated by its contact with the skin; and this appliance has all the value of a poultice, with the further advantage that the patient is not exposed to the risk of a chill, as sometimes happens with the other method, unless the poultices are changed very rapidly and carefully. Instead of warmth, Niemeyer recommends the application of cold by the use of cloths dipped in cold water, and frequently changed. But this method, although it no doubt reduces the temperature, yet is usually attended by such discomfort to the child, that it can with difficulty be persevered with for long together.

The bowels must be watched, for constipation would tend still further to increase the heat of the body; and when necessary therefore, the bowels must be relieved by small doses of castor oil or syrup of senna.

The diet is very important. Until the consolidation is complete the child should be kept low; his food should be limited to small quantities of milk and broth, but he may be allowed to quench his thirst with cold water or toast-and-water in moderate quantities. If the patient be an infant at the breast, it is well to limit the number of times he is allowed to suck; and this he will bear readily if some fluid substitute, such as thin barley-water or plain water, be given him at intervals with a spoon, for his desire for the breast is the result of thirst and not of hunger. As soon as the establishment of bronchial breathing and the disappearance of crepitation show that effusion into the air-cells has ceased, the diet should be improved; but great care must be exercised in this respect, for while the patient is in a state of high fever his digestive power is necessarily very limited. The alteration should consist more in the frequency of his meals than in the quality of his food. Strong beef-tea may be substituted for weak broth, and that and the milk should be given to him at short intervals during the day and night. The milk should be guarded by the addition of small quantities of the saccharated solution of lime in the proportion of fifteen drops to each small teacupful. The yolk of an egg beaten up with milk may be given once in the day if it is found to agree.

Directly the temperature falls, quinine should be at once administered, and the diet of health can be returned to, using, however, special precautions that the articles selected be digestible, so that the newly recovered powers may not be overtasked.

In the case of a secondary pneumonia, care must be taken to support the strength which has usually been much reduced by the previous illness. In these cases stimulants are often required early, and ammonia and bark may be given from the beginning. Beef-essence or strong beef-tea should be ordered if the child be eighteen months or two years old, and he should take plenty of milk. In these cases the brandy and egg mixture of the pharmacopœia is of great service.

## CHAPTER IV.—PLEURISY.

PLEURISY, a more common disease in young children than is often supposed—Symptoms—Physical signs, their peculiarities.
Case X.—An ordinary attack of pleurisy—Comment.
Case XI.—Circumscribed pleurisy—Comment.
Case XII.—Empyema—Absorption of the fluid—Comment.
Symptoms of empyema—Temperature—Modes of termination.
Case XIII.—Empyema—Spontaneous evacuation.
Pleurisy with retraction.
Case XIV.—Great distortion of chest from pleurisy.
Case XV.—Empyema—Secondary acute tuberculosis—Comment.
Pleurisy a cause of basic lung disease.
Case XVI.—Fibroid induration of lung resulting from pleurisy.
Diagnosis—Prognosis—Treatment—Paracentesis—Mode of operation—Effects of puncturing lung.
Case XVII.—Traumatic pneumo-thorax from puncture of lung during paracentesis.
Case XVIII.—Repeated paracentesis.
Slight danger of paracentesis—After treatment—Diet.

OF all chest diseases in children pleurisy is perhaps the one in which mistakes in diagnosis are most often made. The symptoms may be so obscure that attention is not directed to the chest at all, especially if several days have elapsed since the onset of the disease; or the physical signs may be so similar to those of pneumonia that the real nature of the disease is overlooked, and the case is mistaken for one of inflammation of the lung. If in the diagnosis of pleurisy in the young child we trust solely to the physical signs, we shall often be led into error. It will be necessary to compare these with the general symptoms and the history of the attack before we can expect to arrive at a just conclusion.

Pleurisy may attack one or both sides of the chest, but in cases of primary disease it is almost always limited to one side. The disease may be present at any age, and is much more common than was at one time supposed under the age of two years.

With regard to the frequency of pleurisy in infants and very young children, information derived from the Registrar-General's statistical returns is very untrustworthy, as, on account of the resemblance of signs to those of pneumonia, the diagnosis as registered on death certificates is not always to be depended upon.

The attack of pleurisy, like that of pneumonia, is sudden, and the first complaint is usually one of pain in the side. The seat of the pain is not, however, always in the chest. The lower intercostal nerves are often affected, and the sensation being referred to the ends of these nerves where they ramify on the abdominal wall, the pain is often seated in the belly. This is important, for in children abdominal pain is apt to be at once attributed to worms or intestinal irritation. It is well, therefore, to remember that it may also be a sign of pleurisy, and in every case where it occurs a careful examination of the chest should be immediately made. The pain varies very much in intensity: it may be very slight in degree or may amount to intense suffering. It is increased by coughing or deep inspiration, and is accompanied by much tenderness. In cases where the symptom is not strongly marked it may often be elicited during percussion, the child being seen to wince at the blow of the finger. In very young children the presence of pain in the side is usually shown by violent fits of crying, lasting for several hours. They show a great disinclination to be nursed or moved about, and when pressure is made upon the chest, as in lifting them up, their cries are immediately renewed. If the pain be a marked symptom its presence in older children is usually at once recognized by the expression of the child's face which is seen to exhibit great distress when, from coughing or other cause, the child has been forced to draw a deep breath.

The breathing is rather hurried, but unless the disease be complicated by pneumonia the rapidity of the respirations is very much less than is the case in inflammation of the lung. On account of the pain the respiratory movement is very shallow, and this shallowness of the breathing may be a sufficient cause to determine its rapidity; for in cases where the pain, as judged by the other signs, appears to be severe, the breathing is especially rapid. Sometimes the nares act slightly during respiration, but this is by no means so constant a symptom as is the case in pneumonia. The pulse is quick at the first, as a rule, but this rapidity is seldom long maintained, and in most cases by the third or fourth day it has returned to its ordinary velocity. The pulse-respiration ratio is little perverted, and seldom falls below three to one. This is important with regard to diagnosis.

Occasionally the onset of the attack is indicated by vomiting, but this is not so common as is the case in pneumonia, where it is a very frequent symptom. There is generally headache, furred tougue, thirst, and loss of appetite, as in all acute attacks. Purging is sometimes a symptom of the beginning, and occasionally the disease is ushered in by rigors or a convulsive fit.

The cough generally begins a few hours after the occurrence of pain in the side; it is short and dry, but much less troublesome than in cases of inflammation of the lung, and may be sometimes so slight as to escape notice altogether. If the pain be severe the cough causes great distress, and the child is then seen to do all in his power to repress the cough, so as to avoid the necessity of drawing a deep breath. The degree of fever varies considerably in different cases. There may be absolutely no elevation of temperature at all, or the evening temperature may be so slightly raised that the elevation escapes notice unless a thermometer be used. Even if a temperature of 102° or 103° be reached at the first, it seldom persists for a longer period than three or four days, when it begins gradually to decline. This *gradual* subsidence of the febrile heat is very different from what is so noticeable a phenomenon in pneumonia, where the temperature falls suddenly at the period of resolution to a point below the ordinary level of health.

The quality of the heat is also a point to be noted. In pneumonia it is of a pungent character, which is very striking, and the skin is at the same time dry. In pleurisy, on the contrary, the heat has not this pungent character, and the skin is sometimes moist, even in the early days of the disease.

On account of this frequent absence of fever, the face is seldom seen to be flushed, as in pneumonia. Indeed, a very characteristic symptom in pleurisy is the pale, rather sallow color of the cheeks, which often at once attracts attention.

Another symptom which forms a great contrast to what we know of pneumonia is the comparatively slight degree to which the strength is reduced. In cases of inflammation of the lung the prostration produced by the disease it, as a rule, very great, while in the case of pleurisy, although differences are of course to be found in this respect, it is not at all uncommon for a child with its pleura half full of fluid to walk without assistance into the out-patient room. It is, perhaps, on this account that the child seldom looks very ill, and, unless disturbed by pain, his face has rarely the distressed expression which is so common in many other acute diseases.

The physical signs of pleurisy may resemble those of pneumonia very closely, and it often requires much care to distinguish by this means between the two diseases. The movement of the affected side is less free than that of the other from the very first. In the beginning this is no doubt the result of an instinctive effort on the part of the patient for the avoidance of pain; but as effusion takes place into the pleura, the expansion of the chest-wall over the seat of disease becomes more and more constrained, and the immobility of the affected side during the respiratory movement presents a marked contrast to the rather exaggerated activity of the other half of the chest. Still, although the affected side of the chest moves less than the other in respiration, the intercostal spaces are not always motionless. In thin children they may often be seen to sink in to an appreciable extent at each inspiration even in cases of great effusion; and this not only laterally but also in the front and at the back of the chest. In observing this sign it is important to distinguish between real and apparent recession; for some of the lower intercostal spaces —the eighth, ninth, and tenth—may appear to sink in through the action of the serratus magnus muscle, the digitations of which, contracting at each breath, elevate the surface under which they lie, so that the intermediate parts appear to be depressed.

If the effusion be large, displacement of the soft parts takes place; and this is a very important sign.[*] The heart and mediastinum are pushed to the right or to the left (according to the side affected), the liver and spleen are slightly depressed, and the intercostal spaces become bulged and slightly widened. In these cases the whole side may become dilated, but the dilatation is often difficult to estimate by the measuring-tape, for enlargement of one side is always accompanied by enlargement of the other. The sound side is enlarged partly on account of the increased size of that lung, which has extra labor thrown upon it, partly as an immediate consequence of the pressing forwards of the sternum by the effused fluid, this displacement necessarily carrying with it the ribs covering the unaffected pleura. A far more valuable symptom is the alteration in shape of the affected half of the chest: the chest-wall becomes flattened laterally, and rather prominent on the anterior face, so as to assume something of a square shape; and this alteration, which can be accurately outlined by the cyrtometer, is a very characteristic feature of the disease. Vocal vibration in very young children can, unfortunately, be seldom detected, and therefore its absence—a sign which is so valuable in the diagnosis of pleurisy in the adult—furnishes us with no information. Sometimes, in children of four or five years and upwards, we can detect a slight fremitus on the sound side as the child speaks, but very often no vibration at all is to be detected at any part of the chest; so that in yonng children we must be prepared to make our diagnosis without its assistance. On percussion we find dulness at the base of the chest on one side. The note is of a peculiar quality; it is a high-pitched, flat sound, which, if much fluid be present, conveys the] idea of perfect airlessness, and is combined with great sense of resistance. In pneumonia the percussion-note is seldom completely dull, and the sense of resistance is very much less. To the practised ear and finger the peculiar quality of the percussion-note, combined with the increased resistance, suggests at once the presence of fluid.

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[*] Displacement of the heart is sometimes prevented by adhesion between the pleura and pericardium. Therefore the absence of cardiac displacement is no proof that the physical signs are due to another cause than pleuritic effusion. Indeed in some cases of pleurisy the heart's apex is found beating to the left of its natural position. Thus in a child aged four there was complete dulness

But, besides the quality of the dulness, we derive great assistance from its distribution. In basic pneumonia the dulness is almost always limited at first to one region of the thorax, usually the posterior aspect. In pleurisy on the contrary, the dulness passes round to the front also, although anteriorly it is more limited in extent. Dulness at the extreme base in front, combined with dulness behind, is strongly presumptive of the presence of fluid. As the fluid increases in quantity the level of the dulness rises both before and behind. It always remains higher behind than in front, although the line which marks its upper limit is sharper anteriorly than at the back, the percussion-note passing more abruptly from dulness to clearness. If the fluid rises higher than the angle of the scapula a tubercular note is obtained under the clavicle in front; this is due to the relaxed state of the pulmonary tissue, which is in contact at that point with the chest-wall. The movability of the dulness, when present, is a sign of the utmost value as to the presence of fluid. It depends upon the fact that the fluid will always, unless prevented by adhesion, gravitate to the most dependent part, and that the limits of the dulness will therefore be altered according to the position of the patient. This symptom is, however, much more commonly to be discovered after absorption of the fluid has begun than during the stage of effusion.

The auscultatory signs of pleurisy in the child may differ very widely from those to which we are accustomed in the adult. In the first place, friction is often absent, or, if present at an early stage of the disease, it may exhibit very peculiar characters. Thus, in the early stages, it has seldom the grating or grazing character which is so distinctive of extra-pulmonary mechanism, but presents itself instead as a sharp crepitating sound, which simulates very closely the rales produced in the smaller bronchial tubes. It is important to be aware of this peculiarity, for otherwise the presence of crepitation, combined with dulness of the base of one side, might mislead us as to the nature of the disease. Crepitating friction is, however, larger than the true pneumonic crepitus, is more superficial, and has not the puffy character so characteristic of inflammation of the lung. It may be heard at the back, front, or side of the chest at the upper margin of the dull area, or even below the level of the fluid.

The breathing is at first very weak at the affected side, and this may be due to the presence of pain, which forces the child instinctively to spare the affected lung as much as possible. The presence of a feeble breath-sound at

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of the whole left side, with weak blowing breathing and absence of vocal fremitus, but the heart's apex was felt to beat one inch to the left of the nipple line.

one base combined with the other symptoms is, as Dr. West has pointed out, a very valuable sign of pleurisy in the child, while the disease is as yet only beginning. As effusion increases the breathing may remain very weak at the base, but higher up (and especially about the angle of the scapula) it often becomes loud and bronchial, and sometimes assumes a tubular character which is undistinguishable from the tubular respiration of pneumonia. This quality of the respiration is not confined to cases complicated with pneumonia, for it may be present when the temperature is not materially increased; nor is it limited to the inter-scapular regions or to the immediate vicinity of the spine, but it may be heard also in front of the chest, and at the sides, below the level of the effusion. In the axillary and infra-axillary regions, indeed, tubular or even cavernous breathing is very common, and this character may be maintained even in cases of very copious effusion. Sometimes the tubular character of the breath-sound is heard even down to the extreme base. The vocal resonance is usually exaggerated and becomes bronchophonic or ægophonic; but it is not necessarily so in all cases where the breathing is bronchial: over a spot where the respiration is markedly tubular the vocal resonance may be almost completely suppressed.

Occasionally the quality of the breathing is found, like the dulness, to vary according to position. Thus, in a rickety child of eighteen months old who suffered from pleurisy of the right side, and in whom the dulness reached upwards to the level of a line drawn round the body at about two inches above the nipple, the respiration was intensely tubular both in front and at the back to within a very short distance of the base. On placing the stethoscope over the nipple, marked tubular breathing was heard while the child sat upright; but on placing him upon his back, the tubular character was lost, and the respiration became of ordinary bronchial quality.

The breathing * is not bronchial in all cases. Sometimes we find the signs to agree very closely with those in the adult, the breath-sound being weak or suppressed except close to the spine. Generally, however, at some period of the effusion bronchial breathing can be detected in the child, for the signs seldom remain stationary; and bronchial respiration heard at one visit may at the next be replaced by a breathing so weak as to be only caught with difficulty; while a weak and merely harsh breath-sound may suddenly assume a loud blowing type, without any apparent diminution in the amount of the effusion or the occurrence of any other symptom to account for the alteration.

A good example of an ordinary attack of pleurisy in the child is seen in the following case:—

### CASE X.—ORDINARY ATTACK OF PLEURISY.

Maurice R., aged 9 years, was admitted into the East London Children's Hospital under the care of my colleague, Dr. Bruce, on December 3. Until a week before admission the boy had been quite well, but on November 26, a cold wet day, he ran about the streets with bare feet. A few hours afterwards he was seized with pain under the right nipple. He did not shiver or seem cold; on the contrary, his skin was very hot to the touch. He was not sick, but complained much of thirst, getting up several times in the night to drink water. A few days afterwards he began to cough.

STATE ON ADMISSION.—Does not look very ill. Eyes bright; lips pink; nostrils motionless. Generally lies on right side. Says he has now no pain. Seldom coughs. Right side of chest moves less than left during inspiration. A feeble vocal fremitus is felt on both sides, but very faintly towards right base. The heart's apex beats rather to the outer side of the left nipple-line, and is therefore displaced slightly to the left. Percussion is perfectly dull all over right half of chest, at the back, front, and side, with increased resistance. Immediately under the clavicle the note is tubular, and it becomes rather tympanitic about the nipple. Respiration in front is weaker at the right side than at the left, and is very high-pitched and bronchial from apex to base. Just below the right nipple a coarse but faint crepitating sound is heard with inspiration: it is superficial, is not puffy in character, is not limited to the close of the inspiratory act, and is not at all like pneumonic crepitation. In

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* The bronchial quality of the breath-sound in the pleurisy of childhood has received little notice in published descriptions of the disease. The late Dr. Anstie, however, drew attention to it in his admirable paper on pleurisy, in Reynolds's "System of Medicine." The phenomenon is one which must be familiar to all who have had much experience of the diseases of children, and therefore its omission from the standard treatises is the more remarkable, especially as ignorance of this peculiar it[illegible]nt be a fruitful source of error in the diagnosis and treatment of pleurisy in the child-

the right axilla the breathing is bronchial and moderately loud, but in the infra-axillary region it becomes very loud and intensely tubular. At this spot the vocal resonance is bronchophonic. In the supraspinous fossa, behind, the respiration is bronchial, and remains so as far as the angle of the scapula; below that point to the base it is very loud and intensely tubular, and at the base the same superficial crepitating sound is heard as was noted in front. Vocal resonance is increased all over right back, and at base is markedly bronchophonic. No alterations either in the percussion or auscultatory signs to be discovered during changes in position of patient. All over left side resonance is normal, and the breathing loud and puerile. Temperature in evening, 104°; pulse, 157; respiration, 30.

On December 6 the fluid had rather increased in quantity, for the heart's apex was felt beating half an inch to the outside of the left nipple-line. Vocal fremitus could only be felt at the upper third in front and at the supraspinous fossa behind. Percussion and auscultation gave the same results as before. Temperature in morning, 99.6°; pulse, 96; respiration, 24. In evening, temperature, 101.6°; pulse, 84; respiration, 22. Temperature, yesterday evening, 100.8°; pulse, 96; respiration, 24.

10th.—Absorption of the fluid has begun. The heart's apex is now just below the left nipple, very slightly to outer side. Intercostal spaces sink in on inspiration at the lower part of the chest. Vocal fremitus is again felt all over right side. On percussion, the apex of the lung is now resonant, the level of the dulness being in front at the second rib, behind at the spine of the scapula. Respiration is obscured everywhere in front by a very loud grating friction-sound, and vocal resonance is only slightly increased at the base. At the supra-spinous fossa the breathing is harsh, with crepitating friction; from the spine of scapula to its lower angle very loud and bronchial; at base bronchial, without any tubular quality, and accompanied by loud grating friction. No vocal resonance at back. Percussion still dull in axillary and infra-axillary regions, especially the latter; but on placing the boy upon his left side the dulness almost completely disappears, returning when the sitting posture is resumed. With inspiration a faint crepitating friction is heard in these regions, which becomes very much intensified by a change in position. The temperature has fallen since last visit, being seldom over 100° in the evening. Pulse 90 to 98; respiration 22 to 30.

13th.—The fluid has greatly diminished since last report. Percussion is now natural at right front and in axillary and infra-axillary regions, except just at the base. At the right back the note is unnaturally high-pitched from the spine of the scapula downwards, but is only completely dull at the base. Loud grating friction-sound is heard all over the right back and side, and also, but less loudly, about the right nipple, in which latter spot only can the breathing be heard. It has a slight bronchial quality. Heart's apex beats half an inch below the left nipple and half an inch to inner side. Temperature in morning, 99°; pulse, 90; respiration, 18. In evening, temperature, 100.4°; pulse, 104; respiration, 21.

The after progress of the case was very slow. The fluid became gradually absorbed, the dulness disappearing first in the front of the chest, but remaining for some time at the base behind. Even as late as February 4 absorption was not quite completed. On that date the following note was taken:—Boy fat, and looks well. No falling-in of the affected side of the chest—on the contrary, there is a slight bulging of the base, as estimated by the cyrtometer. The right side moves well with inspiration, except towards the base, where the movements seems rather hampered. In the upright position there is complete dulness at the right posterior base, with considerable resistance. The upper margin of this area is well defined, the dulness passing abruptly into good resonance above. When the boy stoops forwards, so that his back becomes horizontal, the dulness is replaced by clearness. Air seems to enter the lung perfectly to the extreme base. Respiration there is loud and slightly harsh, and a feeble catch of friction is heard at the end of a deep inspiration. Vocal resonance is slightly increased, and vocal fremitus, felt everywhere else about the chest, is here hardly perceptible.

A few days afterwards the boy was discharged from the Hospital, but he returned on March 7 for examination. By this time all the physical signs had disappeared, with the exception of a feeble crepitating friction, which was caught towards the end of inspiration in the infra-axillary region.

The above example affords a very good illustration of the peculiar characsers of the physical signs often met with in the pleurisy of childhood. In such a case the intensely tubular quality of the breathing, and the crepitating character of the friction-sound, might lead to error in diagnosis unless close attention were paid to these signs and to the general symptoms by which they are accompanied.

The history of the attack, which was stated to have begun suddenly with pain in the side preceding the cough, pointed distinctly to pleurisy; and the general symptoms noted on the boy's admission were sufficiently characteristic. He did not look very ill; the strength was not much reduced; the cough was rare; the nares motionless; and although the temperature was high, being 104°, yet the breathing was not hurried, and the pulse-respiration ratio consequently undisturbed.

On examination of the chest the dulness was found to be extreme, a dead, flat note being elicited by the finger, which is characteristic of the presence of fluid, while the sense of resistance was very much increased. The dulness was very extensive, and reached to the front of the chest, the whole of the right side being dull from apex to base. The tubular breathing was limited to the base at the side and back. If the case had been one of pneumonia, tubular breathing would have been heard over the whole of the dull area.—Besides these signs, which were very distinctive, the heart was displaced to the left—a change of position which is not seen in cases of mere consolidation of the lung; and vocal fremitus, which was well marked on the sound side, was *felt* but faintly at the back over the seat of effusion. The superficial crepitating friction-sound, too, which occupied the whole extent of the inspiration, was very different from the puff of fine crepitation heard at the end of a deep inspiration in pneumonia. Besides, this was noted only at the base of the chest, where the breathing was tubular. In pneumonia crepitation ceases in the part of the lung which has become sufficiently consolidated to allow of the production of tubular breathing.

As the case advanced, and the fluid began to be absorbed, the loud grating friction and the alteration of the percussion-note on change of position furnished additional evidence, had further proof been wanting, of the nature of the case.

Sometimes the fluid, instead of being free to occupy the whole of the pleural cavity, is confined to certain regions—is circumscribed, as it is called,—by bands of lymph which cause the pleural surfaces to adhere at particular spots so as to partition off the parts in which effusion takes place. In such cases the disease is less easy of diagnosis, and is still more likely to be mistaken for inflammation of the lung.

### CASE XI.—CIRCUMSCRIBED PLEURISY.

Emma W., aged 5, a delicate-looking child, with small features, fair hair, and a thin transparent skin, had had a cough more or less for two years—ever since a severe attack of pertussis. There was a little dulness at the right supraspinous fossa, and the breathing there was high-pitched and harsh, with prolonged expiration. She was still under treatment when (on May 30) she had an attack of measles. The disease ran its usual course, but the cough was very severe. On June 7 she began to complain of pain in the right side; she still coughed a great deal, seemed languid, had no appetite, and was very hot at night, perspiring freely. She was seen on June 14, looking pale and weakly, but could walk well (she had, indeed, come on foot to the Hospital), and was not at all prostrated by her illness.

On examination of the chest the front of the right side was found to be completely dull from apex to base, with greatly increased resistance. The dulness did not extend into the axillary region, but ceased laterally rather abruptly at a line drawn downwards from the anterior fold of the armpit.—The breathing above and just below the clavicle was bronchial; over the lower two-thirds it was very loud and tubular, without any rhonchus. Over the area of dulness the resonance of the voice and cough was unnaturally strong. At the right back there was no dulness, with the exception of that at the supra-spinous fossa already referred to, but the respiration from apex to base was bronchial, with a fine subcrepitant rhonchus towards the end of inspiration. Temperature in axilla, 99.2°; pulse, 136, unequal; respiration, 50.

On June 21 the subcrepitant rhonchus had disappeared from the back, erwise the signs remained the same as on the previous visit. The cough was very troublesome, the appetite poor, and she perspired very much at night. Temperature 99.6°; pulse, 146; respiration, 42.

The child improved but slowly, and it was not until July 31 that any notable change was observed in the physical signs. By this date the child was fatter and looked pretty well, although pale, and she slept well at night, but was sometimes disturbed by her cough. The dulness was now less complete than before at the right front, and below the clavicle was rather tubular. The breathing was cavernous from apex to base, without rhonchus, and the vocal resonance bronchophonic. At the back the supra-spinous fossa alone was dull and the breathing there cavernous, as in front; lower down the respiration was bronchial, and at the base merely harsh. No rhonchus was heard at the back, and the vocal resonance, except at the apex, was natural.

After this the patient was not seen again for six months. By this time she had become fat, and looked very well. There was a little flattening of the right mammary and infra-mammary regions; the right nipple was a little lower than left; and the spine was slightly curved, with concavity to right. The chest measured at the level of nipple on the right side ten inches and one-eighth, on the left ten inches and a-half. There was no dulness anywhere about the right side; the supra-spinous fossa even was quite resonant, and the breathing everywhere healthy. About the right nipple a faint superficial crepitating sound was heard with the latter half of inspiration. This was no doubt pleuritic, and was the only indication left of the foregoing disease. The child was said to cough sometimes in the morning on first rising, but not afterwards in the day.

The treatment throughout consisted of quinine and cod-liver oil.

In this case the limitation of the principal physical signs to the front of the chest furnished a possible source of error, which it required a careful consideration of the general symptoms and of the whole aspect of the case to avoid. Dulness limited to the front on one side, combined with tubular breathing and increased resonance of the voice, suggested the presence of pneumonia, and this view was supported by the hurry of respiration, which on the first visit reached the number of fifty in the minute. The dead, flat character of the dulness was, however, very different from the incomplete dulness of pneumonia; the resistance to the finger was also greater, and the area of dulness was rather abruptly marginated towards the axilla. The entire absence of rhonchus of any kind from the front of the chest was a phenomenon rarely to be met with in a case of inflammation of the lung, and itself suggested pleurisy. Such a condition is, however, occasionally found where the pneumonic consolidation is very complete, but it rapidly passes away, seldom persisting longer than two or three days. In the present case rhonchus was absent throughout. It is unfortunate that no mention is made in my notes of the presence or absence of vocal fremitus, nor of the position of the heart.—These are two important omissions, which deprive us of what might have been of great assistance in the diagnosis.

Besides the physical signs, the general symptoms were very decidedly opposed to the pneumonic view of the case. The child, although pale and delicate-looking, had not the aspect of one seriously ill, and she had been able to walk without assistance to the hospital. This point is of very great importance, and tells very strongly not only against pneumonia, but also directly in favour of pleurisy. That a child with caseous deposit at the apex of one lung, who had but just passed through an attack of measles, and who presented *recent* physical signs such as those described, should be able to walk from her home to the hospital without apparent suffering, could only be possible in a case of pleurisy. Had the disease been pneumonia, consolidation of such extent, especially when succeeding to measles, would have been attended by a degree of prostration sufficient to put such an effort out of the question. Besides this, the temperature of the body was little higher than natural (99.2°), and at night she perspired freely.

There can be little doubt, therefore, that the case was one of circumscribed pleurisy. The subcrepitant rhonchus heard at the back was due to accompanying bronchitis, so common during and after an attack of measles; and the bronchial breathing heard posteriorly was no doubt conducted from the front of the chest. The hurry of respiration must be attributed to the exertion she had just undergone.

The diagnosis was confirmed by the after progress of the case. The long persistence of the physical signs without notable change, and especially with-

The vocal resonance is everywhere on the left side bronchophonic, and as heard at the angle of the scapula the quality of the voice is rather ægophonic. Temperature, 6 p.m., 100,2°; pulse, 154; respiration, 58. Since August 31 the temperature has seldom been over 99° in the morning; in the evening it has varied from 101° to 102°.

The physical signs remained very stationary from this date until the end of the month, although the heart was gradually drawn back to its natural position.

On October 1, the chest measurement at the level of the nipple was, on the right side 9 1-2 inches, on the left 9 7-8 inches. Half a teaspoonful of ol. morrhuæ was ordered to be taken three times a day in addition to the iron mixture.

October 9.—Percussion is now natural in front of left side, and the left supra-spinous fossa is resonant. Over the scapular region the percussion-note is tubular, and at the posterior base it is dull. Respiration is bronchial at the base behind; superiorly it is harsh, with prolonged expiration. All over the upper half of the left back is a peculiar clicking sound like very small bubbles, not at all superficial. In front the breathing is merely harsh; in the axillary and infra-axillary regions it is slightly bronchial and is accompanied by a faint crepitating friction.

From this date the physical signs became gradually more and more healthy, and on November 5 the least possible dulness remained at the left base behind, but the breathing there and everywhere else was perfectly natural, without friction or any other abnormal sound. The child became quite fat and strong on his legs. The spleen, however, did not diminish in size, but remained very large, reaching as low as the level of the umbilicus.

The history of the attack in this case was very characteristic, and the distortion of the left side of the chest (lowering of the shoulder and scapula, with slight lateral curvature of the spine), inconsiderable though it was, combined with the physical signs, rendered the diagnosis of pleurisy an easy matter. Absorption of the effused fluid was evidently far advanced, but the elevation of temperature seemed to imply that the presence of purulent matter in the pleura was injuriously affecting the system, and it was therefore thought advisable to remove what little there may be left without delay. The after progress of the case, although slow, was satisfactory, and the speedy improvement which followed the administration of cod-liver oil is to be noted. The oil might indeed have been given with advantage at an earlier period. The child was the subject of rickets, and in such cases the influence of this drug in furthering nutrition and improving the general condition is very striking. The enlargement of the spleen, one of the consequences of the rickety state, did not appear to impede recovery, although the size of the organ remained unaltered. Such cases, indeed, generally do well.

Empyema causes great interference with the nutrition of the patient. The child wastes more and more, becoming daily thinner, paler, and weaker. His appetite is lost, he is restless and irritable, and sleeps badly at night. The circulation is feeble; the fingers become clubbed at the extremities; and the hands and feet are often cold, although the general temperature of the body is raised towards the evening, and the child perspires profusely in the night. Empyema is, indeed, accompanied by a considerable amount of fever. The temperature is almost always over 100° in the evening, and rises sometimes to 102° or 103°, but sinks to a lower level in the morning. The highest temperature is generally found at about 2 or 3 p.m., after which the fever abates to some extent. There is often much tenderness of the affected side, and the child shows great distress when a physical examination of the chest is made.

If no operation is performed for the evacuation of the purulent fluid, this may become gradually absorbed, and the child may eventually recover. In other cases the fluid points at some part of the chest; a swelling appears at one of the interspaces, becomes red, and after a few days bursts, and the fluid slowly drains away. When this takes place the child may recover, the opening closing after several weeks; or the perforation may remain open, and the child die, worn out by long-continued suppuration. Instead of opening externally, a perforation may take place into a bronchial tube, and the fluid be evacuated in the form of profuse expectoration. These cases also often end fatally. In a third class of cases the presence of purulent fluid in the pleura seems to be a determining cause of a general formation of tubercle, and the patient dies from acute tuberculosis.

### CASE XIII.—EMPYEMA—SPONTANEOUS EVACUATION OF THE FLUID.

Annie B., aged 5, a thin child, rather small for her age, very pale and weakly-looking, had been suffering, it was said, from "low fever" for a considerable time. Her illness had begun in the middle of February, with fever and cough, and she had ever since been getting paler and thinner, although the fever had in a great measure subsided. Her cough was still troublesome, but was loose, and gave her no pain.

When seen on June 4 she complained of pain in the left hypochondrium, and this part was said to swell at times. On examination the left side of the chest was seen to be almost motionless in respiration. There was no fulness at the seat of pain, but that spot seemed tender on pressure. The whole left back was completely dull from apex to base, with increased resistance. The breathing was loud and almost cavernous over the whole dull area, and the vocal vibration was annulled except at the supra-spinous fossa, while the resonance of the voice was everywhere increased. In front of the same side percussion was dull and the breathing blowing, although weaker than at the back. The heart was displaced slightly to the right.

A few days afterwards a swelling the size of a hen's egg formed in the left nipple line, the centre of which was over the sixth intercostal space. This was very tender to the touch, and fluctuated freely. As the mother objected to any operative procedure, she was directed to apply a succession of hot linseed-meal poultices. In the course of the week a second swelling appeared higher up on the same side just below the nipple. This also fluctuated. The superficial veins of that side, both of the chest and belly, were very well marked. The skin over the abscesses became very red and tense, and on July 3 the lower one burst, and discharged a considerable quantity of thin purulent fluid. After this the upper swelling subsided without opening. The child seemed at once very much relieved; her appetite, which had been quite lost, returned; her spirits improved, and she began at once to regain flesh.

On July 28 the following note was taken:—Looking much fatter and stronger; runs about, and her spirits are good; eats heartily. Cough loose, and very troublesome at night. Perspires very much, especially when in bed. The abscess is still discharging, and about an ounce of thin watery fluid comes away from it in the day. There is much flattening under the left clavicle, and the left front of chest does not move in inspiration; laterally, however, the intercostal spaces sink in a little in inspiration, and the ribs move slightly. Spine curved laterally, with convexity to right. Shoulder and lower angle of scapula on the left side rather depressed. Percussion is dull all over left half of chest—both front and back. In front no respiration is heard at all, but over the whole left back it is loud and blowing. Vocal resonance there is slightly stronger than natural.

After this report the child was not seen again until the following February, six months afterwards. The improvement then was very remarkable. The abscess had continued to discharge for six weeks. It had then closed, and the child had been ever since constantly improving. She now coughed very little, and only in the morning or after exertion, and then sometimes expectorated a little thick yellow phlegm. She was fat, and looked strong and healthy.

On examination of the chest some slight retraction was seen at the lower part of the left side, but the deformity was scarcely noticeable; the left shoulder was not depressed, the spine was straight, and the nipples were on the same level. The apex of the heart beat one inch below the nipple in the nipple line. No dulness was found at any part of the left side, and the respiration was generally healthy, although towards the upper part of the left back it was rather loud and slightly blowing. Vocal vibration was felt faintly as far as the extreme base.

This case affords a very good illustration of the extraordinary readjusting power possessed by childhood. The left lung had been exposed for a considerable time to great pressure from the effused fluid, but it had, notwithstanding, been able, on the removal of this fluid, again to expand, and to do this so effectually as almost entirely to remedy the deformity at first noticed, and which threatened at one time to become permanent.

When fluid has existed for a considerable time and has exposed the lung to great pressure, its removal, however effected, is often followed by retraction of the diseased side of the chest. Serious deformity from this cause is, however, [illegible] frequently seen in the child than it is in the adult, probably on account of the tendency to rapid repair which has just been referred to. Still, instances of serious chest distortion are occasionally met with.

### CASE XIV.—GREAT DISTORTION OF CHEST FROM PLEURISY.

Thos. MacE., aged fourteen, was brought to the East London Children's Hospital with much deformity of his chest, the result of an attack of pleurisy fifteen months before. The right side was much retracted. The shoulder and scapula were markedly depressed; and the spine was curved laterally, with the concavity turned towards the affected side. The scapula, besides being depressed, was tilted backwards at the lower part, so that its inferior angle projected. In front the infra-clavicular region was deeply hollowed; the nipple was half an inch below the level of the left; and, at the lower part of the affected side, a special depression of the seventh rib, retracted below the level of the others, left an oblique diagonal groove passing transversely downwards towards the middle line. There was very little movement of this side during inspiration. The veins of the chest were unusually full, and the heart was drawn to the right so that its apex could be felt beating at the ensiform cartilage. The circumference of the thorax at the lower part of the sternum was on the left side 13 1-8 in., on the right only 11 1-4 in. The percussion note on the right side was generally high pitched, without being anywhere completely dull. The breath sound, above, was loud and harsh; below it was much weaker, and was rather bronchial. The vocal vibration was exaggerated, except at the base in front. The boy was in fair health, but was subject to cramp and to breathlessness after exertion.

This case is not given as an illustration of extreme retraction, but furnishes a fair example of the more serious form of chest distortion seen in children as a consequence of pleurisy. In such a case the tilting backwards of the angle of the scapula, the marked depression of the shoulder, and the absence of signs of excavation would distinguish the disease from fibroid induration of the lung—a complaint which also produces great retraction of the side. (See Chapter VII.)

When the purulent fluid is not evacuated, either spontaneously or by operation, its retention in the chest-cavity is always attended with considerable risk; for not only is the general nutrition of the child seriously affected while such fluid remains, but there is also a direct danger that its presence may lead to the development of general tuberculosis, as in the following case:—

### CASE XV.—EMPYEMA—SECONDARY ACUTE TUBERCULOSIS.

Charles B., a little boy, aged two years and nine months, sixteen teeth, was admitted into the East London Children's Hospital on September 17.

Little information could be gained as to the history of his attack. The mother could only say that he had been healthy two or three months previously ;that he had then begun suddenly to cough and lose flesh, and that during the last month his bowels had been relaxed five or six times a day, causing him to waste very rapidly.

State on Admission.—Child greatly emaciated; eyes hollow; cheek-bones project; complexion rather earthy; head square-shaped; fontanelle size of a shilling, depressed; veins of forehead full. Abdomen rather swollen, and feels hot to hand; abdominal veins full; no enlarged glands felt in belly on deep pressure: spleen and liver appear to be of normal size. Ends of long bones not large; fingers slightly clubbed. Tongue clean and red. Stools yellow, slimy, and offensive. Has a frequent cough. Temperature in rectum 100.6°; pulse 130; respiration 40.

Physical Signs.—Very little respiratory movement comparatively on right side. Intercostal spaces not bulged, and can be seen to sink in to a slight extent on that side at the lower front; but on the left side they sink in deeply at each inspiration. Heart's apex beats on the left side in the fifth interspace in nipple-line. The chest measurement at the level of the nipple is on the right side 8 7-8 inches, and on the left 8 5-8 inches. No vocal fremitus felt either side. Percussion dull all over right side, back and front. Behind the dulness is complete, with extreme sense of resistance. In front the dulness is more tubular, especially under the clavicle. and does not reach quite to the middle line. Still, the percussion-note at the right edge of the sternum is not quite resonant. Respiration all over right lung is loud and bronchial, with intense resonance of voice and cry. Between the scapulæ the breathing is cavernous. Here and there dry rhonchi are heard, but there is no friction or crepitation. The left lung is apparently healthy.

A lead and opium mixture was ordered to check the diarrhœa, and ten drops of brandy every three hours. For his diet, bread and milk. The diarrhœa ceased at once, and the child's appetite began to improve. He continued still very thirsty, and the temperature remained high, varying from 100° to 102° —generally one degree of difference between the morning and evening temperature.

September 24.—Child seems weaker. The bowels act twice a day; motions not offensive. Physical signs as before. The right side seems tender, and the pressure of the stethoscope causes pain. Cough loose and rather frequent; if the child coughs violently all the veins swell up, even down to the wrists; jugular veins then much distended. Temperature in evening 102.4°; pulse 120; respiration 30. He was ordered ol. morrhuæ ʒ ss. ter die, with a mixture containing tinct. ferri perchlor. Some meat and broth on alternate days were added to his diet.

On October 4 the respiration on the right side in front was covered by a grating rhonchus, and at nipple a coarse crepitation was heard. These, however, had disappeared by October 9. On this date the two sides of the chest were measured with cyrtometer, when at the nipple level the right side was found to measure 8 7-8 inches, the left 9 1-8 inches. The temperature remained high at night, varying from 101° to 103°, or even 104°, and sinking to 100° in the morning; pulse 130 to 140; respiration 44 to 48.

22nd.—Child wasting more and more. Physical signs much the same on right side. Over lower part of right front fine bubbling is heard at the end of a deep inspiration. On the left side percussion is rather dull in the supra-spinous fossa, and generally over the left back is too high-pitched. Respiration in supra-spinous fossa is bronchial, below, harsh, with a little dry rhonchus. Over left front respiration is harsh, with a little sonorous rhonchus. Temperature in evening 104°; pulse 120; respiration 48.

On October 25 the child had an attack of diarrhœa. The temperature then fell to 100° in the evening, and remained low till October 29, when the thermometer again marked 104° in the rectum.

On November 5 the percussion signs were unaltered, but under the right clavicle the loud bronchial respiration was accompanied by a large metallic bubbling rhonchus which was also heard downwards as far as the extreme base. At the nipple the breathing was blowing, almost tubular. The same bubbling rhonchus was heard also in the right infra-axillary region and at the back, but posteriorly the bubbles were smaller and less metallic. After a violent cough the rhonchus partially disappeared at the front and side. On the left side some fine crepitant rales were heard at the end of inspiration. Temperature in the morning 102°; pulse 130; respiration 44. In the evening, temperature 103°; pulse 132; respiration 56. On the previous evening (November 4) the temperature had been as high as 105°.

From November 5 to November 19 the temperature continued exceedingly high in the evening, the thermometer marking 104° to 105°, and on one occasion (November 15) 106° in the rectum. There was always a great fall towards the morning, and the heat of the body was almost uniformly 99° at ten a. m. There was usually a difference of about twenty beats between the morning and evening pulse, and the respiration was also higher at night, ranging at that time from 42 to 60. The subsidence of the fever in the morning was always accompanied by a marked change in the behavior of the child. In the morning he would sit up in bed and play with his toys, eat a hearty breakfast, and sometimes cry out for cake. In the evening he lay with flushed face and parched lips, completely indifferent to all that passed around.

On November 18 the bubbling rhonchus was universal on the right side, and at the left back the breathing was harsh and was accompanied by a rhonchus coarser than before, and mixed here and there with a finer crepitation.

On November 20 patches of dulness were discovered at the left back, and there was greater resistance to the finger; the breathing on that side was bronchial, and everywhere it was accompanied by a course bubbling rhonchus as on the right side. On this date the temperature suddenly became lowered; in the evening it reached no higher than 99.2° On the following morning 97°, and fell in the evening to 95.2°. A few hours afterwards the

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child died. The temperatures were taken throughout the case in the rectum, and with great care.

AUTOPSY.—Body extremely emaciated. Right lung almost entirely adherent to chest-wall; the adhesions with difficulty broken down, especially at apex, where they are so firm that the lung is torn in bringing it away. A little purulent fluid—about one ounce—is found in right pleura at the base. Right lung smaller than left, tough and firm. Scattered through the substance, and forming nodules projecting on the surface under the pleura, are yellowish-white, non-friable tubercular masses, varying in size from a pin's head to a pea. These have not the granular appearance of cheesy masses, and do not appear to be softening. With them are more pellucid small bodies, evidently grey granulations. In many places, where the tubercles are collected closely together, the intermediate lung tissue is the seat of quite recent broncho-pneumonia. Left lung not condensed, but presents the same masses. It was firmly adherent to the pericardium, which could not be detached from it. The same masses are found in the spleen, which is thickly studded with them. They are also present, although to a less amount, in the kidneys, and on the upper surface of the liver are some grey granulations. There are no granulations in the meninges.

The diagnosis in this case was not difficult. The complete dulness over the whole of the right half of the chest, both at the back and at the front, combined with the extreme sense of resistance; the breathing, which was everywhere loud and piercingly bronchial; the intense bronchophonic resonance of the voice and cry; the absence of liquid rhonchus or crepitation,—these signs occurring, without any contraction of the side, at so late a period of the disease (for the child had been ill two or three months at the time of his admission) could only be the result of pleurisy. Inflammation seldom affects the whole of a lung from apex to base, and pneumonic consolidation, if extensive, does not long remain indolent. Small pneumonic deposits may remain unchanged in children for many months, and may eventually be removed; but large deposits soon begin to give evidence either of commencing absorption or of degeneration and decay, leading to destructive disease of the lung in which they are situated. Again, the sense of resistance to the finger on percussion is very much greater when fluid is present, or in the case of a lung solidified by pressure, than where the consolidation is owing to pneumonia; and this alone is a very important element in the diagnosis. The heart, again, was slightly displaced to the left, and the apex was found to beat in the fifth interspace in the nipple-line. It had been probably pushed further to the left, but was being drawn back into its normal position as the effused fluid became gradually absorbed. At the time of admission there was probably little fluid left in the diseased pleura, for the intercostal spaces on the affected side were not prominent, and were seen to sink in slightly at each inspiration.

In the after progress of the case the continued wasting, the high evening temperature, combined with the occurrence of dry and crepitating rhonchi on the diseased side, and eventually in the opposite lung, pointed to the occurrence of secondary tuberculosis.

The pleurisy was here evidently the primary disease, occurring, as it did, suddenly, while the child was in his ordinary health; and the tubercle was a secondary formation. In many cases, however, tuberculosis is the primary disorder, and itself gives rise to secondary pleurisy. The pleurisy is then generally of the fibrinous variety, a plastic exudation being thrown out, which is seldom attended by liquid effusion, and gives rise to but few symptoms, pain in the side being as a rule the only thing complained of.

The ordinary serous pleurisy is always accompanied by a certain amount of fibrinous exudation, and when this is extensive it may lead to secondary results after the fluid which was first thrown out has become reabsorbed. These cases form a special variety of basic lung disease, to which, as occurring in the adult, attention has been directed by Dr. Andrew Clark. The pathological alteration consists in an excessive formation in the base of the lung of fibroid tissue, which causes a loss of elasticity of the part, so that it no longer contracts and expands as in health. If present to an extreme degree, the part attacked shrinks, the bronchial tubes become dilated, and the heart may be drawn towards the affected side. At first, however, there is no contraction

The following case furnishes a good illustration of the early stage of this condition before the occurrence of contraction:—

### CASE XIV.—FIBROID INDURATION OF LUNG FROM PLEURISY.

Martha B., aged 8 years, a thin but not unhealthy-looking girl, was admitted as an out-patient under my care at the Victoria-park Hospital in February, 1873. She had been out of health for twelve months. Her illness began in January, 1872, with cough and pains about the body. At first she was an out-patient at the London Hospital; but after three months she ceased to attend, although she still coughed a great deal, and was losing flesh. Ever since, she had continued to cough, and had slowly wasted. In the autumn the child passed some weeks in Suffolk, and seemed to derive benefit from the change.

When I first saw her on February 6th the cough was said not to be very frequent, and to be dry. Her appetite was good, the bowels regular, and she slept well at night. Skin quite cool, and not rough or dry to the touch. The right shoulder and angle of scapula were on rather a lower level than the left; and there was a slight curvature of the spine, with concavity to the right. The right nipple was, however, rather higher than the left. The edge of the liver could just be felt below the false ribs. The chest expanded pretty well superiorly, and equally on both sides; laterally the chest was rather flattened at each base, and the movement was limited,—the right base not expanding at all. The intercostal spaces were well marked inferiorly at each side—perhaps more so at the right than the left,—and they certainly sank in more at the right side during a deep inspiration. The heart's apex beat close to the left nipple, just below it on the inner side.

The chest measured, at a point one inch below the nipple-level, on the right side 11 inches, on the left 10⅞ inches. At the level of ensiform cartilage the right side measured 10⅞ inches, the left 10⅝ inches.

Vocal fremitus was stronger on the right side than on the left, from above downwards as far as the nipple in front and the angle of the scapula behind. Below these points it could not be detected on the right side, although on the left it could be felt faintly as far as the extreme base. On the right side percussion was resonant from the apex as far as one finger's-breadth below the nipple in front, and the angle of the scapula behind. Below these points it was completely dull, with considerable sense of resistance. The change, however, from clearness to dulness was not abrupt; at the upper level of the dulness the percussion-note had a tubular quality all round the right side from front to back. There was no change in the percussion-note on change of position. Over the dull area the respiration was everywhere very weak, but distinctly bronchial, without friction or rhonchus of any kind, and the vocal resonance was completely annulled. Elsewhere in the same lung, and also in the left lung, respiration was loud and healthy.

After a few days the cough became looser, and the child expectorated a little phlegm. In the morning the cough was rather prolonged, and on one occasion after coughing for some time she brought up some frothy phlegm with retching efforts.

On February 28 the girl was transferred as an in-patient to the East London Children's Hospital, and there, in order to be able positively to exclude the presence of fluid, I requested my colleague Mr. Reeves to make an exploratory puncture into the right base with a fine trocar. This was accordingly done, but no fluid was found.

The case was a very interesting one, and simulated very closely a pleurisy of the right base; but there were certain distinguishing points to be taken into consideration. In the first place, the intercostal spaces on the right—the diseased—side were as well marked as at the corresponding part of the left side, and during inspiration sank in, if anything, rather more deeply. Then, the transition from dulness to resonance was not abrupt; at the upper limit of the dull area a tubular note was found. If fluid be present this is seldom the case, the change from a dull to a clear note being then usually immediate and complete. Again, no alteration of the percussion-note was found on change of position, the dulness still persisting when the child was made to stoop forwards so as to bring the back into a horizontal line. This sign was one of very great importance, for although in an early stage of pleurisy it is not uncommon to find that changes in position produce no corresponding change in the physical signs, yet later on in the disease, after absorption has begun, it is comparatively rare to find the physical signs absolutely unaffected by position, as in this case. Lastly, the exploratory puncture made by my friend Mr. Reeves furnished a complete proof of the absence of fluid; the canula penetrated to a sufficient depth to insure the escape of fluid had any been present.

The child was last seen in the month of May, 1873. She was then fat and looked very well, but still coughed occasionally. On examination of the chest the physical signs were found to be unaltered.

The case was no doubt one of fibroid induration of the base of the right lung, without contraction, consequent upon an attack of pleurisy. The prolonged fit of coughing which is mentioned as having occurred on one morniug, ending in retching efforts and the expectoration of frothy phlegm, is characteristic of this condition, and is due to the loss of elasticity of the smaller bronchial tubes. If these are much dilated, the secretion usually accumulates in them and putrifies, so that the expectoration is very offensive. In such cases a faint fine bubbling is often heard at the seat of disease.

Pleurisy in the child frequently passes unrecognized, and in hospital practice it is common enough to meet with cases of the disease the nature of which seems to have been previously misapprehended. "Low fever" or "debility" are names constantly applied to cases of pleuritic effusion; but here, in all probability, the chest had never been examined at all. In other instances, where an examination of the chest has been made, but no doubt very hurriedly and superficially, the disease is spoken of as "liver complaint" or "phthisis." An error in diagnosis is only excusable after we have exhausted all the methods at our command to arrive at a conclusion. In no case of disease in the child should an examination of the chest be omitted, and if there be any obscurity in the symptoms, such an examination is imperatively called for. Even when the examination is made with all care, an error may still be fallen into, and the disease be confounded with pneumonia. This mistake is hardly to be wondered at when we remember the resemblance between the physical signs of the two diseases—a resemblance which is by no means so generally recognized as its importance requires. If, however, we consider the whole aspect of the case, noting the manner of invasion of the disease, and comparing the physical signs with the general symptoms, this, with accurate observation of the character of the signs, will in most cases enable us to avoid an error.

The initial symptoms—pain in the side or belly, followed by cough, usually with fever, but only slight reduction of the strength—should at once suggest pleurisy, and these symptoms are tolerably constant. There is little disturbance of the natural relation between the pulse and the respiration; and the face, unless the pain be severe, seldom shows evidence of distress. In pneumonia the pain in the side, if present at all, is slight, and occurs subsequently to the cough, the pulse-respiration ratio is greatly perverted, the prostration is as a rule extreme, and the child has the aspect of one seriously ill.

When effusion has taken place, the dead, flat percussion-note with greatly increased resistance, the cavernous or blowing or merely weak bronchial breathing, and the increased resonance of the voice or cry—these signs discovered at the base, and *found at the front of the chest as well as at the back*, are very characteristic, and if the disease be an acute primary one are diagnostic of pleurisy. In cases, however, where there is fibroid thickening of the lung with dilated bronchi, a secondary pneumonia may spread with great rapidity, so as to involve almost at once the whole thickness of the lung, and produce dulness on percussion both before and behind. Still, in such cases, other well marked symptoms are present to distinguish the disease from pleurisy. Vocal fremitus persists; there is no displacement of organs, or displacement, if present, is found in an opposite direction to that which obtains in cases of effusion; the dulness is not the toneless dulness of pleurisy; and finally abundant crisp metallic rhonchus is heard with the breath-sound.

In a primary basic pneumonia the physical signs are limited at first to the back or the front of the chest, and are not found in both situations; and besides, the puff of fine crepitation caught at the end of a deep breath is seldom absent in pneumonia, and is very different from the larger superficial crackling sound produced in an inflamed pleura.

On account of the feebleness of vocal vibration of the chest-wall in children, no information is be derived from the absence of fremitus, unless this is to be felt over other parts of the parietes; nor, on the other hand, does a strong fremitus necessarily exclude the presence of fluid, for vibration of the chest wall may persist even where the effusion is copious. In a boy, aged 10 years, lately a patient in the East London Children's Hospital, and from whose chest ten ounces of fluid were removed by paracentesis, vocal vibration before the operation was well marked, and was little, if at all, weaker over the diseased side than over the healthy part of the chest. Alterations in the voice or cry present in themselves nothing characteristic unless the quality is markedly ægophonic, in which case only may the sign be considered presumptive of the presence of fluid in the chest.

When the effusion reaches high up in the chest the heart is displaced and the intercostal spaces are obliterated, and these are very valuable diagnostic signs. In such a case, too, the complete absence of rhonchus over a dull area of large extent is much more common in pleurisy than in other forms of chest disease, and if present in a case of acute consolidation of the lung would not persist for many days in succession. Again, the alteration in the shape of the affected side, which becomes somewhat square in outline, as evidenced by the cyrtometer, is a very characteristic feature of an extensive pleuritic effusion, and one which is not found in cases of consolidation.

The want of accordance between the physical signs and the general symptoms is another striking feature in the disease. A child is said to be languid, to have lost his appetite, and to be losing flesh; but he coughs little if at all, and walks about as usual. On examination half or the whole of one side is found to be dull on percussion, with loud bronchial breathing, and the heart is displaced from its natural position. In such a case the slightness of the general symptoms would be in itself an important element in the diagnosis.

The color of the face is also a characteristic symptom. In pleurisy the cheeks have often a uniform straw tint, which is unlike the complexion of any other disease.

In the diagnosis of pleurisy in the young child, morbid growths in the lung, which in the adult often occasion great perplexity, may be left out of consideration. One case, indeed, occurring in a boy of twelve, has been placed upon record by Dr. Clifford Allbutt; but such cases are, fortunately, very rare, and I do not know of any instance in which a young child has been found so affected. In excluding a growth the history of definite beginning as in pleurisy, and the regularly square outline of chest as taken by the cyrtometer, are points of great importance. In every case of doubt an exploratory puncture,[*] repeated if necessary several times, should be resorted to.

A combination of pleurisy with pneumonia is often met with. In these cases the general symptoms are more severe, and the pulse-respiration ratio is perverted; but, if attention be paid to the character and distribution of the physical signs, the presence of fluid can scarcely be overlooked. Often, however, the pleurisy in these cases is of the fibrinous variety in which scarcely any fluid is present. Here, if friction be absent, as so frequently happens in young children, the diagnosis is extremely difficult, and the complication constantly remains undetected. It is common in the post-mortem examination of such cases to meet with recent signs of fibrinous pleurisy, the existence of which had been unsuspected during life.

When pleurisy occupies the right side and the effused fluid is small in amount, its existence sometimes passes unrecognized, especially as friction is often absent, and the very limited dulness is attributed to the liver, which in young children rises higher into the chest than is the case with adults. If, however, proper care be taken, the mistake should not be made. The dulness produced by a small collection of fluid, such as would be present in the case supposed, presents all the characters which have already been sufficiently dilated upon. It is a perfectly dead dulness, and is accompanied by a marked sense of resistance. Besides, the upper limit is very clearly defined; and this is a very important distinguishing mark. In the case of ordinary liver dulness at the right base, the dulness passes somewhat gradually into clearness, for the thin border of the lung overlies the upper margin of the liver, and so modifies the percussion note at that point; while in the case of a small liquid effusion the transition from extreme dulness to clearness is usually abrupt.

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[*] The ordinary hypodermic injecting syringe forms a very useful instrument for this purpose. In making an exploratory puncture care should be taken to select a spot where the skin is thin, as just below the axilla, and not to introduce the needle in the back, where the skin is much thicker, and the pain, therefore, proportionately great.

Again, in cases where an enlarged liver rises up into the chest, the dulness reaches to a higher level in the front than at the back, while in the case of fluid the level of dulness, if higher at one point than another, would be higher posteriorly. In all cases of uncertainty percussion should be made while the patient is in different positions, so as to test the effect of gravity upon the dulness. If the note become clear on a change of position, the presence of fluid is placed beyond the possibility of doubt. A good instance of the condition here described is seen in the case of Maurice R., as noted on February 4 (see p. 76). If the child had been seen for the first time on that date, the presence of pleurisy might on a careless examination have passed undetected. In cases of basic lung disease, such as that of Martha B., the diagnosis is more difficult. The distinguishing points in that case have already been insisted upon. If any doubt exist, an exploratory puncture should be made with the hypodermic syringe.

The diagnosis between pleurisy and hydrothorax presents some difficulty, for the physical signs are identical—being due in each case to a collection of fluid in the chest cavity. Hydrothorax, however, is usually double, and there is no accession of fever when the effusion occurs, as is almost always the case at the onset of a secondary pleurisy. Besides, in a passive exudation resulting from some impediment to the circulation, evidence is usually to be obtained of similar effusions taking place in other parts of the body.

Between pleurisy and collapse of the lung the distinguishing points have already been discussed in a previous chapter. (See Chapter II.)

Simple primary pleurisy generally ends in recovery, and even when the disease has reached the stage of empyema the prognosis is far from being unfavorable. The great danger before the evacuation of the fluid is the occurrence of acute tuberculosis as a result of the purulent collection; and in cases where the fluid is continually reproduced so as to keep up a daily discharge through a canula or open fistula, there is great probability of amyloid degeneration taking place in the internal organs.

The age of the child has not appeared to me to influence the prognosis of primary pleurisy. Infants, if strong, have seemed to do as well as older children; but pleurisy, attacking an infant worn and wasted by a long course of bad feeding, is necessarily a very fatal disease.

In secondary pleurisy the danger is in proportion to the degree of weakness of the patient at the time the complication occurs. On account of the serious reduction of the strength which takes place in pneumonia, pleurisy coming on secondarily in such a case renders the chance of the patient's recovery very doubtful indeed.

The treatment of pleurisy at first is simple, and consists in perfect quiet, warmth to the chest, a carefully ordered diet, and the administration of a simple saline. The severe measures which used to be at once resorted to in the treatment of every case of pleuritic effusion, are now set aside for simpler remedies. Bleeding need only be mentioned to be condemned. The only form in which it would be for a moment admissible is that of the application of a leech to the side to relieve pain; but this is now unnecessary, as we have in the hypodermic injecting syringe an instrument which enables us to effect the same object rapidly, and without the withdrawal of blood. In pleurisy a child wants all his strength, and to lower it is to do him harm. Mercury, again, which used to be the indispensable remedy at a time when its influence in promoting the absorption of all serous exudations was held in universal belief, is now practically abandoned in the treatment of pleurisy. In children the drug should never be given unless the indications for its employment are very decided, on account of the anæmia and depression which it is so apt to induce; and the best authorities now concur in believing its value as an absorbent in cases of pleuritic effusion to be more than doubtful.

The child should be kept perfectly quiet in bed. Hot linseed-meal poultices, frequently renewed, should be applied to his chest; or the upper part of the body may be swathed, not too tightly, in a broad flannel bandage wound round and round the chest and crossed over the shoulders. His diet should be carefully suited to his powers of digestion, and should consist principally of milk and light broth. For medicine he may take a citrate of potash mixture, or a draught containing a solution of acetate of ammonia with sweet spirits of nitre. If the pain in the side be severe, the hypodermic injection of morphia, in the proportion of one-thirtieth of a grain for a child of twelve months old, will give very rapid relief.

In children who are old enough to describe their sensations, very severe pain referred to the epigastrium and accompanied by marked oppression of breathing is usually indicative of inflammation affecting the pleura overlying the diaphragm; and in such cases the action of this muscle during respiration may cause great suffering. When this occurs the application of a bandage to the belly, so as considerably to restrict the action of the diaphragm, will often give immediate ease.

If the cough be distressing, small doses of opium should be given by the mouth. It is important to keep the bowels properly relieved, for any distension of the stomach would increase the uneasiness of the patient. For the same reason a careful watch should be kept over the digestive functions, and any signs of dyspeptic fermentation of food should at once cause us to reconsider the dietary, and restrict the quantity of farinaceous or other fermentable matter which is being taken. Violent purgation is to be avoided, for, as in all acute chest disorders, irritation of the bowels seems to be attended with anything but benefit to the patient.

When effusion into the pleura has ceased, measures must be at once adopted to hasten absorption of the fluid. Counter-irritation of the chest-wall has long been extensively employed to effect this object, and although the value of the practice has lately been called in question, yet in this disease it has always seemed to me to yield very satisfactory results. I have certainly met with many cases where fluid, which under treatment previously adopted had not perceptibly diminished in quantity, has begun at once to be absorbed immediately that counter-irritation was made use of, and this although the other treatment remained in all respects the same. I prefer the liniment of iodine to any other form of counter-irritant. A spot about the size of the palm of the hand should be well painted over with the liniment twice a day until the skin begins to crack and peel. Another spot of the same size should then be selected, and the process be repeated in exactly the same manner.

At this time the child should be put upon as dry a diet as possible, for by diminishing the quantity of food taken into the body the blood is stinted of necessary liquid, and a stimulus is thus given to absorption. For medicines the iodide of potassium is very useful, and generally increases very much the secretion from the kidneys. Iron, in the form of the tincture of the perchloride, is also of great service, and should be given in tolerably large doses —five to twenty drops, according to the age.

If the above measures are not found to produce the desired result it will be necessary at once to consider the advisability of paracentesis. This operation is attended with no risk to the patient, and there should be no hesitation about performing it the moment it is thought advisable to do so. On account of the early period at which the fluid becomes purulent in children, and the danger of such purulent collection giving rise to tuberculosis—a result of the disease which ought especially to be guarded against,—an effusion should never be allowed to remain longer than three weeks if no signs of absorption have been discovered. Even before that period it is sometimes necessary to evacuate the pleural contents. Thus, if, without causing actual attacks of dyspnœa, the accumulation of fluid be so great as to press upon the opposite lung and hamper the breathing, or if there have been several fits of dyspnœa when the collection of fluid is large—in either case the operation should be performed without unnecessary delay.

In emptying the chest the pneumatic aspirator is often employed. This instrument is preferred by many on account of its preventing the admission of air into the pleura. This danger, however, is more theoretical than real, and the aspirator has little advantage over the ordinary canula and trocar. By these the fluid can be evacuated more slowly, quite as safely, and without fear of the instrument getting out of order.

A fine canula should be chosen, and the puncture should be made, as recommended by Bowditch, in a line drawn downwards from the angle of the scapula. Bowditch recommends the operator to ascertain by percussion the inferior limits of the sound lung, and to introduce the canula two inches above this level on the affected side. If, on account of the thickness of false membranes, no fluid is found at the spot first selected, a second puncture can be made a little higher up, nearer the axillary line.

If a fine canula be used, the introduction of the instrument causes little pain, and anæsthetics are unnecessary. The chief discomfort during the operation arises from the cough, which often becomes very violent and distressing. This appears to be the result of the irritation of the pleura set up by the instrument. Trousseau's explanation, that it is a consequence of the irritation of air entering the disused lung, is scarcely a sufficient one, for the severity of the cough is not proportioned to the amount of effusion, and therefore to the degree of compression of the lung, but may be very distressing although the quantity of fluid in the chest is scanty. The fluid has at first the ordinary appearance of purulent matter, but if the operation be performed by the aspirator, it may become after a time tinged with blood, and often at the end of the tapping seems to consist of pure blood. When this is the case, the needle should be at once withdrawn. The blood does not come from a puncture of the lung, but is probably, as Trousseau suggests, poured out by some ruptured vessels of the pleura, or of false membranes which were becoming organized. Even if the lung be punctured during the operation, and air be extravasated into the pleura, no apprehension need be excited by the accident, as traumatic pneumo-thorax thus produced appears to be accompanied by little inconvenience, and soon disappears.

### CASE XVII.—TRAUMATIC PNEUMO-THORAX, FROM PUNCTURE OF THE LUNG DURING THE OPERATION OF PARACENTESIS.

Matilda H,, aged 6 years, was admitted into the East London Children's Hospital on April 2, after suffering for a fortnight from cough and some fever. All over the left side there was complete dulness on percussion, with weak bronchial breathing, and absence of vocal resonance. The respiration was almost entirely abdominal, and the heart was pushed to the right. The child looked well, and had not the characteristic complexion of pleurisy, but her temperature was high in the evening, rising usually above 101°. On April 16, the thirtieth day of the disease, the child was punctured with the pneumatic aspirator, and eight ounces of thick greenish yellow inodorous pus were withdrawn. At the end of the operation there was a gush of air through the canula, and on the instrument's being withdrawn the following physical signs were noted:—"Percussion amphoric all left side; respiration loud and amphoric, with metallic tinkle after cough; heart's apex immediately below nipple." The temperature that evening was 100°. One week afterwards the air had completely disappeared from the pleura, and except for some slight dulness at the base, and also at the supra-spinous fossa, with bronchial breathing, and superficial clicking sounds, the physical signs were natural. When the child left the hospital, on May 25, the physical signs were those of health, except that the breathing remained very weak on the affected side, and that there was some slight curvature of the spine, with the concavity towards the left. Her weight was found to have increased by three pounds. In this case there can be little doubt that the lung was punctured by the aspirating needle, and that traumatic pneumo-thorax was produced. Still no inconvenience to the patient seemed to be occasioned by the accident; the temperature that evening was only 100°, and in a week the air was completely re-absorbed.

In order to avoid wounding the lung, no anxiety should be shown to remove every drop of the fluid, for even if all be not withdrawn, the operation usually gives a sufficient impetus to absorption to enable the rest of the fluid to be removed by the natural processes of nature. When the fluid has been evacuated, the fever generally subsides at once, and if pus do not re-accumulate in the pleura, the temperature soon becomes normal. Not unfrequently, however, the purulent collection is reproduced. The temperature then rises again, and remains elevated until the operation for the removal of the fluid has been repeated. In this way paracentesis may have to be performed several times. At length the purulent matter ceases to return, and the case may be considered to be cured.

Sometimes, however, purulent matter continues to re-collect as often as it is evacuated. In these cases the chest may be tapped with the ordinary trocar and canula, and the latter may be left in the wound. The canula must be kept *in situ* by fixing it with strapping to the chest wall, and it should be worn as long as pus continues to flow. This is, perhaps, the simplest and not the least successful method of treating the disease. Little fear may be entertained of the consequences of air entering the chest, for although in theory such an occurrence has been usually regarded as in the highest degree disastrous, and numberless ingenious plans have been devised to render it impossible, yet the actual truth seems to be that it is attended by wonder-

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fully little danger. After the fluid has ceased to flow, the side of the ches should be covered with a large pad of tow, so that any purulent secretio which may ooze out may be at once absorbed. Every morning the discharg of accumulated fluid may be assisted by bending the child over to the diseased side. If thought desirable, the chest may be washed out every day by injecting warm water through the canula, and allowing it afterwards to flow out again through the tube. Often, by this treatment, pus ceases to be formed for a short time. If two or three days have passed without any appearance of discharge from the canula, the instrument may be withdrawn and the opening allowed to close. The disease may then be considered at an end.

The following case furnishes an illustration of this method of treatment:—

### CASE XVIII.—EMPYEMA—REPEATED PARACENTESIS.

Amelia M., aged 5 years, was admitted into the East London Children's Hospital, suffering from empyema of the right side, dating from an attack of pleurisy seven weeks before. The chest was tapped four times with the pneumatic aspirator, and on each occasion a quantity of thick inodorous pus was withdrawn. After each operation the temperature, which before was elevated, fell considerably, and remained normal for a few days; it then rose again as the fluid began to re-accumulate. At the fifth operation the chest was tapped with an ordinary trocar and fifteen ounces of brownish-yellow inodorous pus escaped. No attempt was made on this occasion to exclude air from entering the chest, and after the purulent contents of the pleura had ceased to flow, the canula was left in the wound, and the affected side of the chest was covered with a large pad of tow. The temperature at once fell from 101° (on the previous evening) to 99°. Pus continued to drain away in small quantities for several days, and then ceased. There was the freest communication between the pleural cavity and the external air, for when the pad was removed from the side to permit of an examination of the chest, the air was heard to pass through the canula at each inspiration with a loud whistling sound.

At the end of a week, no discharge having been noticed for some days, the canula was withdrawn and the wound allowed to close. During the next fortnight the child gained 4 1-2 lb. in weight. Just before her discharge from the hospital, the physical signs were the following:—"The right side, at the lower part, moves very little with inspiration, but there is no contraction of the side; the spine is perfectly straight, and the shoulders and angles of the scapulæ are on the same level. Measurement just above the ensiform cartilage, on the right side, 10 1-2 in.; on the left, 10 5-8 in. Vocal fremitus only to be felt at the upper third of the right side, both before and behind. Elsewhere, on either side, it is imperceptible. The percussion note is high pitched towards the base behind, with increased resistance, but the note is not altered by position. Respiration there and all over right side of the chest at the lower half is harsh and weak, without friction. Temperature normal."

In cases where it is intended to keep the canula in the chest, the seat of puncture should be low down, so as to effect as complete drainage of the chest as possible. Cases do not always end as quickly and fortunately as in the one just narrated. It is frequently necessary for the patient to wear the canula for months, or even years, before the discharge ceases and the cure can be considered to be complete. When the discharge is thus persistent, it is advisable to pass a drainage tube through the original opening, and bring it out at another part of the intercostal space. The operation is not an easy one, especially if there be much contraction of the side, but the soft caoutchouc tube is much more convenient to the patient than the silver canula, and the evacuation of the purulent fluid is more complete. If the fluid become offensive, the chest should be washed out daily with a very weak solution of iodine or carbolic acid. In all these cases the utmost care should be taken to avoid a new chill. The patient should be anxiously guarded from sudden changes of temperature, and it is useful to keep the chest covered with a long flannel bandage.

The amount of deformity, even in cases where an opening in the chest has been maintained for a considerable time, is often very much less than would be expected, and the rapidity and completeness with which such deformities may be repaired is often very surprising. The great danger, when the discharge of pus is constant, is in the supervention of amyloid disease of internal organs. Children appear to have a special tendency to this form of degeneration, and it may prove eventually a cause of death.

If the case be seen for the first time when the empyema is pointing, the swelling must be lanced, so as to allow of the escape of the fluid. If, however, the skin be not very red, the chest may be punctured behind, in the ordinary situation, and the threatened abscess disregarded. In such cases the pus soon disappears from under the skin and the swelling subsides. The same plan may often be adopted with advantage, even if the empyema have already burst high up in the chest. Where this has occurred, the fluid being retained in the pleural cavity, and escaping only with difficulty, is usually intensely offensive: the introduction of a drainage tube below efficiently drains the pleura, allows of thorough cleansing of the cavity, and permits the upper opening to close. Weak injections of iodine (Tr. Iod.: ʒ ss, Aq. ℥ j) in these cases effectually control the fœtor, and the patients often do very well.

In every case where no signs of absorption of a pleuritic effusion have been noticed three weeks after the beginning of the disease, paracentesis should be performed without hesitation, The operation is not a dangerous one, and its results are in the highest degree satisfactory. Out of fourteen cases of paracentesis in the East London Children's Hospital during the years 1874-5, in all of which the fluid was purulent, ten of the cases recovered. Of the remaining four, two were taken out by the parents while still under treatment, and the issue of the disease is therefore doubtful, and two died. Of the deaths, one occurred from amyloid degeneration of all the internal organs, after the patient had worn a drainage-tube for eighteen months: the other was a feeble child, who became the subject of pleurisy while much reduced from bad feeding and general unhealthy surroundings. The chest was punctured several times, the fluid each time re-accumulating, and the patient died apparently from exhaustion. No post-mortem examination was obtained in this case, but the liver and spleen were enlarged, probably from amyloid degeneration.

In all cases of empyema, especially after the fluid has been evacuated, the diet should be as nutritions as possible. Meat, eggs, and milk should be given as freely as the child's powers of digestion will allow, but the stomach should not be overloaded with too large a quantity of food at one time. Especial care, indeed, should be taken not to *overfeed* the patient in our anxiety to supply material necessary to enable him to withstand the exhausting drain upon his system caused by the purulent discharge. For medicines, quinine and iron are especially indicated. Cod liver oil, too, is very useful, and I have found Dr. de Jongh's light brown oil to be more completely digested by weakly children than the oils in common use in hospitals. M. Duboue recommends the administration of tannin after evacuation of the fluid in empyema. He states that this drug acts as a tonic astringent, improving digestion and diminishing secretion. It may be given in doses of from three to five grains several times in the day. Small quantities of wine or brandy are also required in these cases.

The above method of treatment is also applicable to cases of secondary pleurisy accompanied by effusion of fluid. In dry pleurisies, such as are common in cases of phthisis, the pain is best relieved by mustard poultices, or by small blisters if the child be old enough.

## CHAPTER V.—ACUTE CATARRHAL PNEUMONIA (BRONCHO-PNEUMONIA—LOBULAR-PNEUMONIA).

ACUTE catarrhal pneumonia especially the pneumonia of infancy—Reasons—The disease differs from croupous pneumonia pathologically as well as clinically.
Pathology—Modes of production—Often preceded by collapse of the lung—Symptoms and physical signs.
Case XIX.—Ordinary acute catarrhal pneumonia in an infant.
Case XX.—Acute catarrhal pneumonia secondary to collapse of the lung—Comment.
Case XXI.—Subacute type of catarrhal pneumonia—Comment.
Favorable termination.
Case XXII.—Gradual subsidence of acute catarrhal pneumonia—Comment.

Bronchiectasis a common consequence of acute catarrhal pneumonia—may occasion difficulty in diagnosis.

Case XXIII.—Acute catarrhal pneumonia with dilatation of bronchus—Comment.

Diagnosis—Prognosis—Treatment.

In a preceding paper we have seen that croupous (lobar) pneumonia may be either a primary or a secondary disease. It may either attack a perfectly healthy subject, or may occur as a complication in the course of some other illness. Catarrhal, or lobular, pneumonia is, on the contrary, nearly always a secondary lesion. In almost every case it is preceded by severe pulmonary catarrh, of which it is one of the direct consequences.

Catarrhal pneumonia is peculiarly the pneumonia of infancy. This, according to Rindfleisch, is the consequence of the greater irritability of the epithelial elements in the child's lung. The cells are larger, contain more protoplasm, and adhere less firmly to the alveolar surface than they do in after life. In the young subject the catarrhal process extends very rapidly and readily from the minuter bronchi to the alveolæ; and therefore, on account of the proneness of the child to catarrhal diseases, especially to pulmonary catarrh, this form of pneumonia is of great frequency, and is much more often met with than the croupons form, which is the more common lesion in the adult.

The distinction between croupous and catarrhal pneumonia is one which lies not only in the clinical character of the two diseases, but also extends to the nature of the pathological process. In croupous pneumonia a highly fibrinous liquid escapes from the blood-vessels accompanied by large quantities of both red and white corpuscles, and coagulates in the air-cells of the lung. The process appears to consist more in extravasation than in exudation; for although a certain proportion of the corpuscles may pass bodily through the walls of the vessels, as stated by ,Cohnheim, yet there is little doubt that actual rupture of the blood-vessels, and escape of their contents, is an important feature in the process. Whether the coagulable matter be merely blood plasma, or consist of that fluid altered in character during its passage from the blood; whether, again, the cells with which the alveoli are choked consist entirely of blood corpuscles, or are composed in part of a rapid multiplication of the cells and nuclear elements of the tissues themselves,—these are questions which, although interesting to the pathologist, are yet comparatively unimportant to the practical physician. The great point of interest to him lies in the fact that in croupous pneumonia the cellular elements filling up the vesicles are exuded or extravasated from the blood.

In catarrhal pneumonia, on the contrary, the cells which crowd the air-vesicles are not derived from the blood at all, but are produced in the cells themselves by a proliferation of the alveolar epithelium. These epithelial cells rapidly multiply and enlarge, and are embedded in a semi-fluid mucoid material which contains little or no fibrin such as is found in the spontaneously coagulable matter which holds together the corpuscles in croupous pneumonia. The process, which is a catarrhal one, takes place in detached lobules scattered through the lung, and the appearance presented to the naked eye is that of reddish-gray nodules dispersed over the organ. The color afterwards changes to yellowish-gray, for the cells, which rapidly enlarge and develop one or more nuclei, soon undergo a fatty metamorphosis. If the fatty change be completed, absorption takes place, and the consolidation is removed; if it remain incomplete, the cells atrophy, the little masses become caseous, and the disease passes into a chronic stage. But besides the changes in the air-vesicles, the bronchi themselves participate in the disease. The walls of the air-tubes become thickened and their calibre is often dilated. Acute dilatations of the bronchi from this cause are very common in children, and the physical signs to which such dilatations give rise may occasion some difficulty in the diagnosis.

This form of pulmonary inflammation is often the result of an extension of the catarrhal process from the bronchi to the air-vesicles, but it may arise in another way. Collapse of the lung is a very common complication of bronchitis in children, and a collapsed state of the air-vesicles greatly favors a rapid multiplication and development of the alveolar epithelium cell. In part through the imperfect aeration of the blood, and in part through the absence of the ordinary respiratory movement in the affected tissue, a great iment is created to the passage of the blood through the capillaries of ed portion of the lung, and a passive congestion is set up. This is soon followed by œdema. Inflammation then occurs at separate points, which may remain isolated, being divided by the congested and œdematous tissue, or may coalesce until a large portion of the lung becomes solidified.

From the above short and imperfect sketch of the pathological processes which give rise to the disease, it is evident that catarrhal pneumonia must almost always be a secondary inflammation. It seems probable that the occurrence of this form of pneumonia is favored by anything which reduces the strength, or which diminishes the respiratory muscular force of the child. Therefore, bad feeding and hygiene, all diseases where catarrh is a prominent symptom, and in fact all diseases which require a recumbent position to be long maintained, and so cause congestion of the posterior parts of the lungs, are predisposing causes which render more probable the occurrence of this complication.

. The difference in the method of production of catarrhal pneumonia—whether or not it is preceded by collapse—have an important bearing in a clinical point of view. The combination with collapse is usually found in cases of pertussis, and the disease is then much more insidious in its invasion, and often runs a subacute and very tedious course. The complaints in which catarrhal pneumonia is especially liable to occur are bronchitis, measles, and pertussis. Severe capillary bronchitis is very rarely left uncomplicated by catarrhal inflammation, and the pneumonia usually in such cases begins early, especially if rickets be present; for this disease, if at all severe, is always accompanied by a certain amount of collapse of the lung. The softening of the ribs, which is so prominent a symptom in severe rickets, offers a great impediment to the entrance of air even if the lungs be healthy; but if the passage of air be further hindered by the addition of pulmonary catarrh, a full inspiration becomes impossible. The patient is, therefore, unable to take in a sufficient supply of air to furnish the means for a successful cough, and the mucus, not being expelled, accumulates in the tubes and causes collapse. The mechanism of collapse and the causes which predispose to it have been already fully considered in a previous chapter.

The course of catarrhal pneumonia is as follows:—After pulmonary catarrh has existed for some little time, a sudden change takes place in the character of the symptoms. The temperature rises, but not to such a height as is found in the croupous form of the disease; the therometer is usually found to mark about 102°. The breathing, which was before hurried, becomes very rapid and laborious, and there is intense dyspnœa. The efforts made to draw in the air are shown by the widely-dilated nares and the violent action of all the accessory muscles; while the insufficient distension of the lungs is evidenced by the great recession of the lower part of the chest-walls and by the sinking in of the intercostal spaces. In fact, although the breathing is so laborious, it is yet shallow. The inspirations are short and imperfect, the expirations noisy and prolonged. This rapidity in the breathing produces the same alteration in the ratio between the pulse and the respiration which is seen in lobar pneumonia. A ratio of 1 to 2, or even of 1 to 1.5, is not at all uncommon; and this varies at different times in the day, for the dyspnœa is sometimes paroxysmal, and occasionally becomes intensified to such a degree as to appear to threaten immediate suffocation. The cough also alters its character. Instead of the loose prolonged cough of bronchitis, we get the short hack of pneumonia. It often occurs in paroxysms, each expiration being accompanied by a short dry cough, which is evidently painful from the distress visible in the face of the patient. At the same time the secretion from the bronchi is diminished, for the rattling of mucus in the chest at each breath, which is so common a feature in bronchitis, can no longer be detected. The pulse is rapid, but small and feeble. Its weakness is no doubt partly due to comparative emptiness of the arteries, on account of the impediment to the passage of the blood through the lungs; and the same explanation applies to the fulness of the superficial veins which is so often observed in the disease.

Examination of the chest often yields no very positive results. As long as the pneumonia remains confined to isolated patches there is seldom any dulness on percussion, but sometimes we can detect a general want of healthy pulmonary tone over the back, and this is more marked on employing broad percussion, striking with three fingers upon three fingers placed upon the chest-wall as pleximetres. Occasionally we find a localized spot of dulness with very limited bronchial breathing, and sometimes the breathing may even approach to the tubular character when the affected portion of lung is of some size from coalescence of several inflamed patches.

The following case well illustrates these symptoms:—

### CASE XIX.—ORDINARY CASE OF ACUTE CATARRHAL PNEUMONIA IN AN INFANT.

L. W., a little boy, aged five months, had had a bad cough, and was feverish for a fortnight. On July 6 he suddenly became very much worse. He was seen on July 7. Skin very hot; respirations very rapid; face livid; nares acting; cough almost constant, short and hacking. There was great recession of the chest-walls at the lower part, and the intercostal spaces of both sides sank in deeply at each inspiration. No dulness was found on percussion of the back at either side, and the breathing seemed natural. In the left infra-axillary region, a little below the level of the nipple, a spot of dulness could be detected, and the respiration there was bronchial, approaching to tubular. Everywhere else the breath-sound was natural.

A saline mixture, containing a few drops of antimonial wine, was prescribed, and the whole chest was ordered to be kept covered with linseed-meal poultices.

The child went on well for a few days, when early on the morning of July 14 he was taken suddenly worse. Breathing excessively rapid; nares acting; much lividity of lips and eyelids, and a general straw-tint all over face; eyes wide open and turned upwards; fontanelle rather elevated and tense; pulse 160, excessively weak; temperature in rectum 102°. Great recession of chest-walls and sinking in of intercostal spaces. The child had been a little convulsed, but had had no regular fit. On examination of the chest no dulness was detected, but the respiration was heard to be tubular in spots about both sides of back. Convulsions came on violently in the evening, and the child died.

It is especially in cases where the pneumonia arises from an extension of the inflammation from the bronchi to the air-vesicles, or where the inflammation occurs in patches of lobular collapse, that the absence of positive dulness is to be noted. When an extensively collapsed portion of lung becomes inflamed, there are usually signs of considerable consolidation, and the dulness is apt to take a form which is very characteristic, presenting itself as a narrow strip along the side of the vertebral column, reaching upwards a variable distance from the base. As the collapse is usually symmetrical, this pyramidal form of dnlness is found on both sides. To detect it, it is necessary to percuss lightly.

Over the parts of the lung unaffected by the pneumonia the physical signs are those of the bronchitis which is present; the respiration is exaggerated and coarse, and is accompanied by sonoro-sibilant and bubbling rhonchi. As the stethoscope is moved towards the consolidated spots the bubbling rhonchus becomes finer and dryer in character, and may even assume the fine puffy character of true pneumonic crepitus if the consolidated part is of any magnitude.

### CASE XX.—ACUTE CATARRHAL PNEUMONIA SECONDARY TO COLLAPSE OF THE LUNG.

George C., aged one year and nine months, a delicate child, who had been troubled for some weeks with looseness of the bowels, was seized with measles on November 21. The cough was very violent, and continued after the eruption had subsided. On December 5 the boy seemed so ill that he was brought to the hospital, and was at once admitted as an in-patient.

On admission, the child was very quiet, and seemed exceedingly ill. His face was pale, with some lividity round the mouth and beneath the eyes; the nares dilated widely at each breath, and the respiration was rather laborious. There was some recession at the epigastrium, and the intercostal spaces of both sides sank in deeply on respiration. The fontanelle, which was the size of a shilling, was depressed, and the pulse was small and feeble. The child had been lately sick; the bowels were still relaxed; and his tongue was thickly furred. Temperature 100.4.° On examination of the chest, dulness was discovered at the left back reaching from the base as far as the lower angle of the scapula; the respiration there was tubular, and much fine subcrepitant rhonchus was heard. There was also dulness at the extreme base on the right back; the breathing was bronchial, and fine subcrepitant rhonchus accompanied both expiration and inspiration. In front there was dulness on either side, and ordinary dry and large bubbling rhonchi along

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Makers

were heard. The child was perfectly quiet during the examination of his chest, and allowed himself to be held in any position without complaint.

On the following day, December 6, the dulness reached rather higher at the left back, and the crepitation there was finer and more puffy in character; the vocal resonance also was increased. At the right back the dulness reached as high as the inferior angle of the scapula; the respiration was bronchial, and inspiration was accompanied by a fine puffy crepitation. Temperature in morning 101.8°, pulse 152, respiration 44; temperature in evening 102.6°.

On the evening of December 9 the temperature was as high as 103.4°, and rose to 105° on the following morning. A few hours afterwards the child died.

At the post-mortem examination there was found solidification of the lower lobe of each lung, extending upwards in a pyramidal form from the base, so that the narrowest part of the consolidation was at the upper border of the lobe. The solidification did not extend the whole thickness of the lung, but occupied only the posterior surface; in front the lobe appeared healthy, and crepitated on pressure. The consolidated parts were of a purplish-red color, but were not depressed. The section was deep red in color, with small greyish patches scattered over the surface—evidently isolated spots of catarrhal pneumonia. The tissue was not tough, but broke down pretty easily under the finger. Much purulent bloody fluid escaped on pressure.

The catarrhal pneumonia from which this child suffered was no doubt secondary to collapse of the lung. The boy was in a weakly state from diarrhœa when he was attacked by measles. The accompanying catarrh was severe, and induced symmetrical pulmonary collapse, which afterwards became the seat of catarrhal pneumonia. The consolidation in this case was of some extent; but the presence of bronchitic rales over the lungs generally, the character of the crepitation heard over the seat of consolidation, and the fact that this and bronchial or even blowing breathing were heard in the same spot, marked out the case very distinctly from ordinary croupous pneumonia. Again, in the diagnosis of catarrhal pneumonia the exact nature of the lesion may be determined by attention as much to the general as to the local features of the disease. In the present case the face was pale instead of being flushed, the two lungs were attacked simultaneously, the breathing was laborious, and the temperature until a few hours before death reached no very great elevation. In all these points, therefore, the disease differed from an ordinary case of croupous inflammation. Besides, the age of the child was of importance; for although croupous pneumonia may attack infants of even a few months old, yet inflammation of the lung is much more commonly catarrhal than croupous under the age of two years. Lastly, the form of pneumonia which occurs secondarily to measles is in the large majority of cases catarrhal. For these reasons the case was looked upon as one of catarrhal pneumonia, and the diagnosis was confirmed by a post-mortem examination of the body.

Children suffering from a severe form of this disease are singularly impassive and regardless of what they would under ordinary circumstances highly resent. They seem not so much stupid as unaffected by ordinary sources of annoyance. Thus, in the child whose case has just been referred to, there was no lack of intelligence in the expression of the eye, but the apathy he showed under examination, and the indifference with which he allowed himself to be shifted from one position into another to suit the convenience of the physician, was a striking feature in the case. When this apathy is carried to such an extreme degree, the prognosis is very unfavorable.

The course of catarrhal pneumonia is not always so acute as in the cases above described. The inflammation often progresses much more slowly, and, indeed, when the disease does not prove fatal within the first few days it usually takes on a subacute course, which may continue for several weeks before reaching its termination. In this form of the complaint the general symptoms are less severe; the skin, although hot, is often moist, and the physical signs may undergo little change for days or even weeks together, the pulmonary lesion appearing to be almost stationary. The child, however, gets weaker and thinner, paler, and more and more apathetic. and

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her birth ; that is to say, her system had been stinted of suitable nourishment on account of the indigestible form in which food had been supplied to her ; and, in addition, she had suffered from an habitual looseness of the bowels, which had still further lowered her strength and reduced a system ill-prepared to support so exhausting a derangement.

In such a state a child falls an easy victim to secondary acute diseases, and the condition of the patient was one especially favorable to the development of catarrhal pneumonia. The respiratory muscles necessarily shared in the weakness of the whole muscular system, and her enfeebled state necessitated an almost constantly recumbent position, which tended to promote congestion of the posterior parts of the lungs.

The disease in this case was evidently an acute one, for the child had only coughed for five weeks previous to her admission into the hospital ; and the consolidation was quite recent, for when the patient was first seen the dulness was not extensive, and it spread gradually after she had come under observation. The chief distinction between this case and one of the ordinary croupous pneumonia lay in the character of the physical signs. The breathing was never tubular ; the rhonchus differed much from true pneumonic crepitation, and, besides, remained audible over the seat of consolidation, even in spots where the breathing was most markedly blowing. The disease also was bilateral, affecting corresponding parts of both lungs ; the temperature was lower than is common in croupous pneumonia ; and, finally, the subacute course of the disease was very characteristic of its catarrhal origin.

When first seen the case might perhaps have been mistaken for one of croupous pneumonia undergoing resolution ; but a reference to the pyrexia would at once have shown that this could not be the case, for in croupous pneumonia the critical fall of temperature precedes by several hours any improvement in the physical signs. Afterwards, the gradual spreading of the signs of consolidation and the persistent elevation of temperature pointed to the true nature of the illness.

It would probably have been impossible in this case positively to exclude tuberculosis, for the catarrhal pneumonia might very well have occurred secondarily to the grey granulation, and there was sufficient evidence in the family history and the personal experience of the child to warrant such a conclusion. Still, the theory of tuberculosis was not necessary to the full explanation of the symptoms ; and partly for this reason, partly on account of the absence of the haggard, wearied expression so characteristic of the constitutional disease, and partly also on account of the seat of the consolidation—which was limited to the posterior base of the lung at each side—it was thought probable that this case was one of uncomplicated catarrhal pneumonia following upon a long period of mal-nutrition.

When catarrhal pneumonia ends favorably, improvement is gradual, and there is no marked crisis such as we see in croupous inflammation of the lung. In the croupous form of pneumonia the general symptoms improve before the local, and a sudden fall in the temperature is the earliest sign of approaching convalescence. In catarrhal pneumonia, on the contrary, the local symptoms are the first to show signs of amendment ; the breathing becomes less hurried ; the cough less harassing ; the superficial veins less prominent ; the pulse fuller ; and the expression more placid ; while all the time the pyrexia continues, and it may be many days before the evening temperature sinks to the natural level of health. The physical signs also improve, but often very slowly, and in cases where the disease has run a very subacute course, weeks, or even months, may elapse before the consolidation is completely removed. This form of pneumonia is especially apt to leave behind it caseous deposits, which, after remaining inactive for a variable time, may begin to soften, and lead to ulcerative destruction of the pulmonary tissue (pulmonary phthisis). The following case illustrates the very gradual improvement which takes place when the disease terminates favorably :—

### CASE XXII.—FAVORABLE ENDING OF ACUTE CATARRHAL PNEUMONIA.

George C., aged six years, was admitted into the East London Children's Hospital on April 21. Two years before he had had an attack of measles, and for twelve months had been suffering from cough following an attack of pertussis. He had long ceased to hoop, but for a week before admission had been troubled with sickness after his fits of coughing. For four days he had seemed very ill, and his breathing had been difficult. When he came into the hospital the dyspnœa was so distressing that he could not lie down in bed. On examination the chest was found to be very much retracted at each base, showing that the child had been subject to attacks of bronchitis, which had produced some permanent collapse at the bases of his lungs. Superiorly, the chest was rather expanded, and the upper part of the sternum projected forward. His breathing was very laborious, his face livid, and his nares acted widely. At each inspiration there was much recession of the lower part of the chest. The boy sweated profusely, especially about the head, and the cough occurred in paroxysms like those of hooping-cough, during which his face became much congested. The paroxysm terminated in a slight hoop, but, there was no vomiting. On examination of the chest, dulness was found at each base behind, rather pyramidal in form, and here the breathing was bronchial, with a large dry crepitation. Elsewhere about the chest the percussion-note was extra resonant, and bronchitic rales were heard. On the evening of admission the boy's temperature was 103.4°. On the following evening, however, it was no more than 101.8°, and for a week the temperature alternated between 101° in the morning and 102° or higher at night. His pulse during this time was 130 to 150, and his respirations 40 to 60. During the first week the physical signs and the general symptoms underwent little alteration.

On April 28 the lividity was noticed to have disappeared, but the respiration remained very laborious, and at each breath there was much recession of the lower parts of the chest-walls. Still the child perspired much less profusely, and his condition was evidently improved. The dulness remained at each base behind, with slightly increased resonance of the voice but with little augmentation of the vocal vibration. The crepitation had become more bubbling in character, and was heard over the lower half of each side posteriorly and to a less extent in front. 9 a.m.:Temperature 100.6°; pulse 130; respiration 48. 6 p.m.: Temperature, 104.6°.

On May 5 the boy was looking very much better. His respirations had diminished in frequency, but still became very hurried after a fit of coughing. There was still dulness at each base behind, although less marked than before. A fine bubbling rhonchus was heard generally over each back, and this over the area of dulness was drier and more crackling in character. Temperature: 9 a.m., 100°; 6 p.m., 102.4°.

On May 8 the physical signs remained much the same, but the general symptoms had greatly improved. The boy could lie down comfortably in bed; his appetite was good; he looked very much better, but still coughed a great deal in paroxysms like pertussis, and sometimes hooped faintly. His temperature still remained elevated. 9 a.m.: Temperature, 100.8°; pulse 118; respirations 48. On the previous evening the temperature had been 101.6°.

By May 12 the cough had become much less frequent, although it still occurred in violent paroxysms. There was still some amount of dulness posteriorly, but the rhonchus had very much diminished, and was now limited to a crackling sound heard towards the end of inspiration, and to a more or less general sibilant wheeze. The temperature still continued higher than natural, being over 100° every evening, and rather lower in the morning; pulse about 120; respirations about 40.

On May 18 the boy left the hospital. His temperature was still about the same—*i.e.*, a fraction of a degree over 100° both morning and evening, although sometimes for a few hours it would fall to 99°. His breathing was, however, slower (34), and his general health had very greatly improved. There was still deficient resonance at the left base behind, This was especially marked at one spot near the spinal column, where the respiration was very metallic and blowing, and the vocal resonance bronchophonic. No rhonchus was heard in this spot, but immediately around it a metallic crackling rhonchus occupied the end of inspiration. The percussion-note over the right back and the chest generally was hyper-resonant,

In this boy—an old bronchitic subject—the lungs generally were the seat of emphysema, but at the bases was a certain amount of permanent collapse, the result of frequent and severe attacks of pulmonary catarrh. This condition of the lungs was partly the cause of the high rate of breathing which persisted after the symptoms generally had so much improved, for this lesion is always accompanied by more frequent respirations, and also by a more labored manner of breathing than is natural to a healthy child. Catarrhal pneumonia, supervening upon such a condition of lung, is very apt to run a subacute course; and in this case the improvement in the symptoms was very gradual, and little alteration in the physical signs was noted from day to day. When the boy left the hospital there was still some unabsorbed consolidation at the left back, and the temperature had not returned to its natural level. While such symptoms persist there is always danger lest the case drift into one of chronic pulmonary phthisis. A deposit may, however, remain unabsorbed for a longer period, without danger, in the child than in the adult; but while it remains there is cause for constant anxiety lest any fresh inflammation be set up in the diseased part to lead to a further extension of the lesion.

It is especially in cases where the disease has assumed a subacute type that the bronchi are apt to dilate. In cases of this kind, recovery, when it occurs, is slow, and if the child be not seen until re-absorption of the consolidating material has begun, some perplexity may arise as to the nature of the case.

CASE XXIII.—ACUTE CATARRHAL PNEUMONIA WITH DILATATION OF BRONCHUS.

Rose H., aged 6 years, was admitted into the East London Children's Hospital on April 30. The child had been ill six weeks. The disease had begun suddenly with fever and a little cough, which, however, was not at first very distressing. After a few days it became more severe, and was accompanied by some pain in the side. Sometimes she expectorated with the cough; and she lost flesh steadily. The girl had had hooping-cough some years before, but no other illness except an attack similar to the present about twelve months previously.

On admission the child looked ill. She was thin; her eyes were sunken and her cheeks hollow (on May 4 she weighed 32 lbs. 10 oz.). Her temperature was 102.8° at 6 p. m. Examination of the front of the chest discovered nothing but a little fine crepitation at the right base. At the right base behind there was dulness on percussion, with weak tubular breathing and a high-pitched metallic large bubbling rhonchus. The vocal resonance was bronchophonic. The dulness did not extend into the infra-axillary region, and the breath-sound was there very weak, with a fine distant crepitating sound accompanying the inspiration.

On May 1 the temperature was 100.2° both morning and evening. Pulse, 104; respiration, 30. After the girl had been a few days in the hospital her general condition improved greatly, but the temperature remained high at night, being generally between 102° and 103°. At the right posterior base the physical signs did not improve; on the contrary, the respiration assumed a cavernous quality, and was accompanied by a gurgling rhonchus, while the resonance of the voice continued to be bronchophonic. By May 18, however, the cavernous quality of respiration was replaced by a diffused blowing sound much less metallic, and from this date the dulness gradually diminished, all the physical signs improved, and the temperature became more natural. On June 4 no dulness was left at the base of the right lung; the respiration was harsh without rhonchus, and the vocal resonance was normal. The girl gained persistently in weight during her residence in the hospital, and left on June 4 weighing 37 lbs. 5 oz. She was treated with quinine, followed by 15 drop doses of liq. ferri perchlor.

In this case the actual physical signs presented by the child on her admission were those of a cavity occupying the base of the right lung at the posterior aspect. The problem was to determine the nature of the cavity, and to estimate the chances of recovery. The history pointed to an acute illness of six weeks' standing which had set in while the child was in health. This was evidently pneumonic, for the dulness was limited to the base behind, and the tubular breathing and crepitating rhonchus were sufficiently characteristic of a solidification of the lung. Had the disease been the remains of a pleurisy the dulness would have been chiefly in the infra-axillary region; the respiration would not have been tubular at so late a period; and any crepitating sounds which might have been present would have been due to friction of the pleural surfaces, and would therefore have been larger and more superficial in character.

What was the nature of the cavity? It might have been due to breaking down of lung tissue, or to dilatation of a bronchus. The child was very thir there was considerable pyrexia; and although the base is a less usual seat ulcerative destruction than other parts of the lung, yet such a lesion v quite possible. There was, however, one serious objection to the ulcerat origin of the cavity: the disease in this case had only existed six weeks, and although caseous deposits may be formed, may soften, and may break down even in a less period of time, yet it is excessively unusual for a *solitary* pneumonic deposit in a child to undergo such rapid softening. In almost all cases of acute phthisis—at any rate in young subjects—the deposits are numerous and are scattered over the lung. For this reason the cavity was thought to be due to a dilated bronchus, and the favorable progress of the case confirmed the diagnosis.

Catarrhal pneumonia is a very common complication of tuberculous bronchitis. In such cases the disease runs a rapid course, and the symptoms and physical signs differ in no appreciable respect from those already described as characteristic of the most acute form of the disorder. The presence of the grey granulation is therefore a matter of inference to be determined by the history of the case, and by the occurrence of new symptoms arising from other and distant organs which have become implicated in the general complaint. This subject will be discussed in a later chapter.

On account of the absence of physical signs in the early period of catarrhal pneumonia, we must be prepared to make our diagnosis of the disease at that stage from a study of the general and local symptoms alone, without aid from a physical examination. The history of the case is usually that a child who had been suffering for some days or weeks with a very bad cough had suddenly become very much worse, with high fever, rapid laborious breathing, and an almost constant hacking cough. We find the patient with a distressed expression and a pale, more or less livid face. His nares act widely; he breathes quickly, but with much effort; and there is great recession of the soft parts of the chest-walls during inspiration. The pulse is small; the superficial veins are prominent; and the pulse-respiration ratio assumes the type so characteristic of pneumonia. His temperature is found to be 102°. Examination of the chest gives little positive information; there is no dulness on percussion, and the stethoscope merely detects general moist rales of varying sizes over the chest and back. The symptoms are those of capillary bronchitis, with this difference—viz., that the temperature is higher than is found in an uncomplicated case of that disease; the respirations are more laborious and are rapid out of proportion to the pulse; and the cough is the cough of pneumonia.

These differences are of the utmost importance. If in a case of bronchitis the cough *suddenly* changes its character and gets short and hacking, while the pulse-respiration ratio becomes greatly perverted, and the temperature rises to 102° or higher, we may safely conclude that the original complaint is complicated by an attack of catarrhal pneumonia.

In cases where, in addition to the physical signs of bronchitis, some local dulness is discovered at any part of the chest-wall, with bronchial or blowing breathing, and a more or less dry crepitating rhonchus, this must be taken as additional evidence in favor of the pneumonic complication.

Lobular collapse of the lung is a disease which presents many points of resemblance with the one we are considering. Both are secondary to bronchitis. In both the lividity is great, the cough frequent, short, and hacking, the pulse small, and the breathing hurried. The natural relation between the pulse and the respiration is altered in both diseases—indeed, in lobular collapse this perversion often reaches its extremest degree—and in both a physical examination may reveal nothing but the signs of bronchitis. Two important points of distinction are, however, found in the temperature of the body and the character of the breathing. In catarrhal pneumonia the temperature is high and the breathing quick and laborious. In lobular collapse, on the contrary, the temperature is normal or even below the natural level, and although the respirations are rapid, the breath is drawn quietly and without effort.

When catarrhal pneumonia affects a considerable area of lung surface, so as to produce extensive consolidation, it presents a combination of the physical characteristics of bronchitis and pneumonia. The signs, however, differ in a very perceptible degree from those of croupous pneumonia even over the actual seat of solidification. As in every case of lung consolidation, there is dulness on percussion, with increased resonance of the cough, and perhaps a perceptible vocal vibration of the chest-wall (although this sign, as in the case of croupous pneumonia in children, is very untrustworthy, but the breathing is often merely bronchial, or, if blowing, usually wants the intense sniffling character so characteristic of true tubular respiration. The crepitation, again, is seldom so fine or dry as in croupous pneumonia; it occupies, also, a greater extent of the breath sound, and is not limited to a fine puff at the end of respiration. Often, it is more a dry sub-crepitant rhonchus than a true crepitation. One of the principal points of difference, however, consists in the fact that while in croupous pneumonia the crepitation is limited to the confines of the consolidated portion of the lung, and is not heard where tubular breathing exists, in catarrhal pneumonia the crepitation becomes finer the nearer the stethoscope is moved to the centre of the consolidation, and is heard in the same spot with the most metallic blowing respiration.

The presence of the accompanying bronchitis is another feature which is characteristic of catarrhal, as distinguished from croupous pneumonia. In the latter the physical signs are limited to the part of the lung which is the actual seat of inflammation; or if rhonchus be heard at any other part of the chest, it is merely of the sonoro-sibilant variety, and is trifling in amount. In the catarrhal form, on the contrary, dry and moist rales are heard all over both lungs.

In acute catarrhal pneumonia the two lungs are often attacked simultaneously, and a characteristic form for the consolidation to assume is that of a pyramidal strip on each side of the spine, reaching upwards from the base. Diffused collapse of the lung is very apt, also, to assume the same shape, and is also generally bilateral; it is, however, distinguished by the low temperature, and the absence of laborious breathing.

The prognosis in catarrhal pneumonia is very grave, and this variety of pulmonary inflammation is much more to be dreaded than the croupous form. Its greater severity may be partly accounted for by the fact that the latter disease is in young children nearly always a primary complaint, while in the case of the former the strength has been already reduced by the bronchitis which preceded it. The age of the child and the degree of vigor possessed by the patient at the time of the attack, exercise a considerable influence upon the ultimate issue of the illness; for weakly children and infants, with their feeble resisting power, and tendency to rapid prostration of strength, have little prospect of passing safely through so formidable a complaint. The danger in ordinary cases is in proportion to the acuteness of the disease and the intensity of the general symptoms. When the inflammation runs a sub-acute course, as it is apt to do after hooping-cough, or in cases where it supervenes upon chronic bronchitis in an emphysematous subject, the chances in favor of ultimate recovery are very much increased.

In severe cases, spmptoms of unfavorable augury are—lividity in the face and blueness of the lips; a greatly perverted pulse-respiration ratio; loss of brightness of the eye; and marked apathy or somnolence. If a young child shows complete indifference to the discomforts of an examination, and allows himself to be disturbed, not only without complaint, but even without manifesting annoyance by any change of expression, the most serious apprehensions should be entertained as to the probable termination of his illness. On the other hand, if the lividity diminish, the breathing becomes easier, and the cough less constant and distressing, a more favorable view may be indulged in, even although the temperature show no sign of falling.

The treatment of catarrhal pneumonia differs little from that of the pulmonary catarrh by which it is preceded. "A cold on the chest" of a child should never be neglected, for while it lasts the child's natural susceptibility to changes of temperature is greatly aggravated, and a fresh chill might set up a severe bronchitis, which would in all probability lead to an attack of catarrhal pneumonia.

In the early stage a pulmonary catarrh may be readily checked by confinement to bed, the repeated application of weak mustard poultices to the chest and back, and the administration of frequent small doses of ipecacuanha wine in a simple saline draught. If the bronchitis be a severe one, counter-irritation is very important, but strong applications are not required. It is better to act slowly upon a large surface of the skin than rapidly upon a small surface. For an infant of twelve months old, one part of flour of mustard may be added to six parts of linseed meal. The poultice should be made with warm, but not boiling, water, and should be large enough to cover the whole of either the chest or back. It may be kept in contact with the skin for three, four, or five hours, or as long as the patient is able to bear it. For older children a larger proportion of mustard may be used, but it should always be sufficiently diluted with linseed meal to allow of the application being kept upon the skin for several hours in succession without producing too severe an irritation.

In giving medicines at this time, care should be taken to adapt the drug to the stage the catarrh has reached, for much mischief may be done by heedless dosing. The rule cannot be too rigidly followed, that in an early stage of pulmonary catarrh, while the bronchial mucous membrane is much swollen, and before secretion has become free, all stimulating expectorants are injurious. At this stage, ammonia, squill, tolu, and the other bronchial stimulants, instead of promoting secretion, only make the cough harder and the chest tighter, and aggravate the irritation which it is our object to allay. Even the old plan of leeching the chest and drugging with antimony and calomel, causes scarcely greater mischief to the child than the modern method of reckless stimulation with ammonia and brandy. In an early stage of the disease, when the oppression of the chest is great and the dyspnœa troublesome, such treatment only increases the distress of the patient, and promotes extension of the bronchitic inflammation to the air cells. Many a case of catarrhal pneumonia has owed its origin to no other cause than injudicious treatment of a pulmonary catarrh. The greatest and most immediate benefit is obtained by medicines which excite the action of the skin and encourage free secretion from the bronchial tubes. If we can do this without at the same time depressing the patient's strength, we adopt the readiest means to relieve his suffering and hasten his ultimate recovery. For a child of one year old, five drops each of ipecacuanha antimonial wines given every three hours in a simple saline draught will have the effect desired. If any depression seem to be induced by the mixture, a few drops of spirits of chloroform may be added to each dose, or a few drops of brandy may be given occasionally in addition. An emetic dose of ipecacuanha given early in the disease is useful in loosening the cough and relieving the tightness of the chest. This treatment, combined with confinement to one room kept at an even temperature, and the application of weak mustard poultices, as before described, will soon produce an improvement in the symptoms; afterwards, when secretion is free and the oppression has been removed, a mixture containing ammonia and squill, with small doses of paregoric, will prove of material assistance in completing the cure. On account of their temdency to collapse of the lung, very young infants suffering from pulmonary catarrh should be carefully watched so that any unfavorable change in the symptoms may be immediately noted. Thus, if the breathing become shallow, and the face at all livid or dusky, they should be at once roused if asleep, and forced to exert their inspiratory power. When an infant cries, his inspirations are much deeper than when he is quiet. A cold wet sponge may be suddenly applied to the naked chest, or vigorous friction may be used to the thorax. An emetic is also useful to clear away the phlegm from the tubes and promote deep inspiration.

Older children should be confined strictly to bed if the catarrh be at all severe; for by this means not only do we protect the patient from a fresh chill, but we also insure a necessary amount of rest. A sick or feverish child requires *repose;* his mind should be kept unexcited and his body quiet; and to put him to bed is the most effectual way of accomplishing this object. Violent purgation is more injurious than beneficial in these cases, but care should be taken that the bowels are properly relieved. It is well to promote the flow of bile by an occasional dose of grey powder. The diet should be simple, and may wisely be limited to milk and broth so long as the cough continues hard and the breathing much oppressed. In proportion, however, as the cough loosens, the diet may be improved, and stimulants may be given if required. Before this they should not be made use of unless the condition of the child imperatively calls for their administration.

When a case of bronchitis is complicated by the occurrence of catarrhal pneumonia, the treatment differs from that already described only by the more energetic use of counter-irritation. The poultices should be large enough to reach completely round the chest and should be kept in contact with the body long enough to produce very deep redness of the skin. In bad cases, even if some slight blistering of the surface be produced, the effect will not be injurious.

The medicines at first should consist of the ipecacuanha and antimonial as recommended for bronchitis; but directly any signs of depression are noticed, this must be supplemented by a necessary quantity of stimulant, or, if thought desirable, must be omitted altogether and be replaced by ammonia and ether given with an alkali. Food must be administered in small quantities at frequent intervals, and should consist of milk with Horlick's patent extract for infants not at the breast, and for older children of milk and broths. If necessary the milk may be guarded by a few drops of the saccharated solution of lime. As the strength fails it must be supported by strong beef-tea, brandy, and the brandy-and-egg mixture of the "Pharmacopœia."

In cases of recovery, care should be taken during convalescence not to be too anxious to return to the diet and habits of health. In particular, the patient should not be overloaded with large quantities of nourishing food, in the hope of more quickly restoring his exhausted powers. Recovery, when it happily occurs in catarrhal pneumonia, is always gradual; and considering the severity of the disease, and the danger escaped from, we must be contented that it should be so.

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## CHAPTER VI.—Chronic Catarrhal Pneumonia and Unabsorbed Pneumonia Deposits—Pneumonic Phthisis.

Chronic catarrhal pneumonia produces the common variety of consumptive disease—Pathology—Modes of Formation of caseous masses—changes which they undergo—formation of cavity—Calcification—Fibroid formation—Secondary changes in other organs.
Symptoms and physical signs—Peculiarities of pulmonary disease in children.
  Case XXIV.—Chronic catarrhal pneumonia—Rapid absorption of the deposit.
Physical signs of excavation—may be produced by dilated bronchi—Method of distinction.
  Case XXV.—Softening and breaking down of a caseous mass—Comment.
  Case XXVI.—Caseous consolidation with dilatation of bronchus resulting from an attack of acute catarrhal pneumonia—Comment.
  Case XXVII.—Chronic catarrhal pneumonia, with secondary acute tuberculosis—Comment.
Diagnosis—Prognosis—Treatment.

The principal form of chronic lung disease in the child arises, as it does in the adult from the presence in the organ of cheesy deposits—the result of a modified process of fatty degeneration taking place in the products of inflammation. These cheesy deposits may be the remains of an ordinary croupous pneumonia, the consolidation having failed to be completely absorbed. This, however, is rare. It is more common to find an acute catarrhal pneumonia, leaving behind it an unabsorbed mass which undergoes the process of caseation, and leads to pulmonary phthisis. The most common form of consumptive disease, however, is the consequence of a chronic catarrhal process—the catarrhal inflammation running a tedious course, stuffing the alveoli with newly-formed cells, plugging the smaller bronchi, and establishing more or less solid nodules in the tissue of the lung. These in most cases extend themselves by a repetition of the same process, and, by the changes which they undergo, lead to the most serious consequences.

In chronic catarrhal pneumonia, the mucous membrane secretes a peculiarly viscid and concentrated fluid, which is loaded with corpuscular elements. In the smaller air-tubes, the channel is often completely plugged by the quantity of secretion; the basement membrane disappears, and the corpuscles permeate the walls of the tubes. In the vesicles, the epithelial cells swell, become detached from the wall, and separate from one another. Their nuclei then divide, an active corpuscular proliferation is set up, and the alveoli become filled with large spheroidal cells, which contain large vesicular nuclei. These changes are accompanied by certain other alterations in the bronchi and pulmonary tissue. The peribronchial connective-tissue becomes increased, so that the walls of the finer air-tubes are thickened in places. The plugging of the smaller bronchi causes collapse of the air-vesicles to which they lead. As a consequence, there is a greater rush of air to the parts of the lung which still remain pervious, and this causes a cylindrical dilatation of many of the minuter bronchi, with marked stretching and thinning of their walls. The collapsed state of the vesicles induces congestion. This is soon followed by effusion of fluid into the air-cells, so that the part becomes œdematous. At this period the affected portions of lung are seen as dark reddish-brown patches, moist, smooth, and of doughy consistence. The consolidation is still capable of removal by absorption of the newly-formed cells, in which case nothin would be left but some thickening of the pulmonary tissue at the spot, with a little compensatory emphysema around it.

If absorption do not take place, the contents of the vesicles next undergo caseation. The newly formed cells accumulate in the alveoli, and become closely packed together. They atrophy and undergo a partial fatty change, which under the microscope, gives a cloudy appearance to the cell, and is indicated to the naked eye by a yellowish-white sharply-circumscribed opacity in the centre of the deposit. Within the area of the caseating mass the pulmonary tissue is destroyed, with the exception of the elastic fibres and coats of the larger arteries, which still remain entire.

At first the inflammation and its accompanying infiltration are limited to the circumference of the smaller bronchi; and on section of the lung we find a varying number of grey transparent nodules, whitish at the centre, varying in size from a poppy-grain to a millet-seed. Each of these is situated in the middle of a lobule. The intervening lung tissue may appear normal to the eye, but it is always more or less congested and collapsed, or is œdematous, or merely emphysematous and pale. Immediately surrounding the nodule is often a zone containing a reddish-grey glutinous infiltration. Gradually the grey nodules increase in size, and become distinctly cheesy; adjoining nodules unite; and finally the whole lobe may become infiltrated and caseous. Sometimes the inflammatory change spreads more abruptly from a large bronchus to the whole extent of lung which it supplies, so that the whole or greater part of a lobe may be at once invaded by the catarrhal and caseating process. This form is the old "tubercular infiltration" of Laennec.

It is then from a catarrhal process affecting the air-cells and finer tubes that pulmonary cheesy masses usually owe their origin. Sometimes, however, as has been said, they are formed in a different way, and a cheesy mass is left as a consequence of an attack of ordinary croupous pneumonia. In all cases of croupous inflammation of the lung, the stage of yellow hepatization is accompanied by a certain amount of catarrh of the alveolar walls. In fact, the principal cause of the change in color of the hepatized part from dark red to reddish-yellow is stated by Rindfleisch to be the hindrance to the passage of blood by the infiltration of new cells in the interstices between the vessels. In ordinary cases this proliferation of epithelium is limited in amount, but sometimes the production of corpuscular elements is so great that the fibrinous pneumonic exudation becomes enclosed in a thick mass of new cells, and the whole undergoes caseation at the same time. By the post-mortem inspection of an affected lung, it is easy to discover what were the chances of a successful termination to the disease. Thus, if the part attacked by pneumonia be found to be sunken, dense, greyish, and slightly granular on section, allowing little fluid to be squeezed out on pressure, and showing under the microscope merely small dwindled cells without any excess of fat-globules, or signs of fatty degenerative metamorphosis, we may be sure that absorption was impossible, and that the chances of recovery in the case has been very small indeed.

After the process of caseation is completed, the cheesy mass may remain without alteration for a considerable time; but, sooner or later, certain other changes take place in it. The period during which a cheesy deposit may remain indolent, varies in different cases; but it may be stated generally that the larger the size of the mass, and the more quickly it has been formed, the more imminent is the risk of softening at its centre. Nodules slowly formed by the aggregation of smaller masses seldom soften before they reach the size of a hazel-nut: while rapidly developed caseating deposits, even of single lobules, may undergo rapid softening. This is found in cases of "acute phthisis," where cheesy deposits of all sizes, and all undergoing a simultaneous softening, may be seen scattered over the lung. In children softening is less common than it is in the adult, and cavities in the lung are more rarely seen. The softening process begins in the centre of the nodules, and is excited by the mere addition of fluid to the mass. The dead, dwindled cells, are those loosened, together with the molecular *debris* in which they lie. The softening is usually preceded by ulceration of the wall of the afferent bronchus—that, namely, which supplies the part, and lies in the centre of the nodule. The cheesy matter, when softened and converted into a pus-like pulp is evacuated through an opening in the air-tube. Certain putrefactive changes then set in, and small fragments of cheesy matter separate from the newly formed cavity, and are expectorated. These, on examination, are found to contain elastic tissue and shrunken cells. Their appearance in the sputum is a sure sign that the cavity is continuing to extend itself. As a rule, when softening begins in a lung containing many cheesy deposits, more than one cavity is formed, and these often open into one another. Sometimes, after the cheesy matter has been removed, the cavity may contract by the formation of fibroid tissue in its wall, and become almost—or, if originally small, quite—closed, the sides cohering as a thick fibroid cicatrix. This is often combined with much proliferation of connective tissue in the lung, so that the part becomes indurated and its bronchi dilated.

Although the changes above described are those most commonly met with in cheesy deposits, yet the masses do not necessarily soften and break down. In exceptional cases a different transformation may take place. Thus, if the nodules are of small size, they may become calcified by the deposition within them of phosphate and carbonate of lime. Afterwards the petrified mass may become encapsuled, and remain embedded in the lung; or it may set up suppuration in the tissue around, separate from it, and be expelled through a perforation in the bronchus. Sometimes the whole caseous mass becomes converted into fibroid tissue, and then a condition is left such as is described in the next chapter under the name of fibroid induration of lung.

The presence in the lung of the caseous products of catarrhal pneumonia is often the cause of secondary changes of a like character occurring in other organs. Thus, the disease is generally confined at first to one side of the chest, but when the softening process invades a caseous pulmonary mass, secondary deposits soon begin to be formed in the opposite lung which had been previously healthy. Again, ulceration of the lung is often found combined with the same lesion in the mucous membrane of the intestine. The parts affected are those in which ulceration also occurs in typhoid fever—viz., Peyer's patches and the solitary follicles in the neighborhood of the ileo-cæcal valve. The follicles become enlarged by a proliferation within them of their corpuscular elements. A cheesy degeneration then takes place, and the caseous follicles soften from without inwards. In this way a sharply circumscribed ulcer is left, which is surrounded by a zone of connective tissue swollen by corpuscular infiltration. The ulcer extends its boundaries by a caseation and softening of the infiltrated tissues; and in this way neighboring ulcers unite and form large oval lesions of surface, of which the long axis is always placed transversely across the direction of the bowel.

Another result of a softening cheesy mass is to set up a true secondary tuberculosis; and in this way the grey granulation may be found after death disseminated over the body, mixed up with the other pathological products proper to the disease.

So long as a small deposit remains completely inactive in the lung, it need give rise to no symptoms at all. If it be near the surface, a physical examination will detect its presence; but unless it cause pyrexia, there is no interference with nutrition, and, if it excite no irritation in the tissue around, there is no cough. In the present chapter the symptoms produced by cheesy deposits and the changes occurring in them will alone be discussed. Tuberculosis and the consequences arising from the formation of the grey granulation in the lung will be described later (*see* Chapter VIII.)

A caseous pneumonic deposit is the ordinary form of chronic pulmonary consolidation, and the changes which occur in it as the softening process invades the mass constitute pulmonary phthisis—pneumonic phthisis, as it has been called, from its origin—the common form of consumption of the lungs. Children in whom this form of pulmonary disease is found do not necessarily present in their physical conformation any special peculiarities of build. They are not all, or nearly all of them, narrow-shouldered, or pigeon-breasted, or shallow in the chest. On the contrary, in children as in adults, we constantly meet with an unabsorbed pneumonic deposit in cases where the thorax is perfectly formed, and where the general structure and appearance are suggestive of anything but "consumption." Still it cannot be denied hat a constitutional predisposition to catarrhal changes in the lungs, and to apid caseation of pulmonary deposits, is often expressed in the physical onformation. In pronounced cases the lungs, as Sir William Jenner has ointed out, are singularly small, and this peculiarity influences the shape of he thorax which becomes elongated, with unusual obliquity of ribs and ab- ormal aching of the diaphragm.

Much has been written about the peculiarities of chronic pulmonary dis- ase in children, and the difficulties of its diagnosis, but these difficulties have been greatly overrated. It is true that the thorax is of small size, and that sounds from the throat are readily transmitted to the chest, but if the child's mouth be open during the examination, the transmission of sounds is in a great measure prevented. It is also true that little trust is to be placed in the amount of vibration of the chest-wall, for in young children vocal fremitus is always weak and is generally absent altogether. But these are comparatively slight disadvantages. On the other hand, the resonance of the voice furnishes as important evidence in the child as it does in the adult. Most children will say "No" when desired. It is a word they understand, a sonorous word, and one which can be pronounced without trouble. From it we can form as sufficient an idea of the state of vocal resonance as we can possibly desire. Again, by gentle percussion with two fingers, the most minute variations in the sonoriety of the chest can be detected without difficulty. The great secret of examining the chest in children is to have the patient raised up to a convenient height. To bend down to a child as he sits on his mother's lap, or in a low cot, is to examine him under very disadvantageous conditions. The child should be always seated upon a table or high stool, so as to bring his body nearer to the ear of the observer.

There are two sources of error which it is important to avoid. In the first place, it is necessary to remember that the breath-sound in a child is naturally loud and coarse (puerile respiration), and that therefore mere loudness and harshness are not the results of disease. In a child, elevation of pitch in the breath-sound is the most valuable indication of alteration from a healthy state. The change is first noticed in the expiration, but it very soon spreads to the inspiration as well, and we then have what is called bronchial breathing—that is to say, both inspiration and expiration lose their breezy quality, and become harder, drier, and higher pitched, and the expiration gets louder and more prolonged. In fact, in young subjects, bronchial breathing seems in many cases to be the first alteration from a healthy state of breath-sound. Mere prolonged breathing is very common in children at all parts of the chest, and especially at the apices; and it is of importance to be aware (as a second source of error) that enlarged bronchial glands assist greatly in conducting sounds from the throat and trachea—so that in cases where the enlargement is considerable, blowing breathing with very long expiration may be heard at the apices of the lungs, although the lungs are themselves quite healthy. In children who suffer from enlarged tonsils, and even in children in whom no morbid condition of the fauces can be discovered, the same peculiarity is often noticed, especially when the lips are closed. On this account it is important to have the child's mouth open during examination of the chest. There is often great irregularity in the breathing of a child. The respirations may vary greatly in depth from time to time; and even in comparing the two sides, the intensity of the breath-sound is often found to be greater on one side than it is on the other. On this account, mere weak breathing in a child, however local it may appear to be, does not necessarily indicate disease of the lung. Sometimes, however, the beginning of pleurisy is marked by weak breathing at one base, but even in this case the respiration is usually also high-pitched or otherwise altered from a state of health. When the breathing becomes bronchial as well as weak, it must be looked upon as a sign of disease.

The symptoms and signs of chronic catarrhal pneumonia are those of a slowly growing consolidation of the lung, which gives rise to pyrexia, and, by the consequent interference with nutrition, occasions some loss of flesh, and eventually, perhaps extreme emaciation. Until, however, the disease is far advanced, the general symptoms are comparatively mild unless there be much pyrexia, and are far overbalanced by the local symptoms and by the intensity of the physical signs. A child may have a cough for a long time without appearing to suffer in any other way; but if, in addition to the cough, we find elevation of temperature at night, followed by slight loss of flesh, we have great reason to fear that the catarrhal condition of the mucous membrane of the finer tubes has spread to the alveoli, and that destructive changes have begun. When thus chronic from the first, the seat of the pneumonia is the same in the child as it is in the adult—viz., almost invariably at the apex of one lung. In a very short time after the symptoms have been noticed, we find the percussion-note at the apex at one side to be high-pitched; the breathing becomes faintly bronchial, and a click or two is heard at the end of a deep inspiration. The alteration in the percussion-note is usually observed first at the supra-spinous fossa. There is, however, here a source of fallacy which it is well to be aware of. On account of the inequality of breathing in early life, and the deficiency of expansion of the upper part of the chest, young children are liable to slight collapse of the apices of the lungs. Such collapses are usually seated at the posterior aspect of the lung, and give rise to slight dulness at the supra-spinous fossa, with weak bronchial breathing, and often a little crepitation at the end of inspiration. If, therefore, the temperature at the time of examination be not elevated, we should hesitate about inferring, from such signs alone, the existence of a caseous deposit, but should wait to correct our first impressions by the results of a second investigation. In the case of collapse the physical signs seldom persist longer than two or three days, and if the child be old enough to regulate his breathing as required, a few deep inspirations will usually cause the dulness to disappear at once.

The caseous deposit is at first limited strictly to one apex, the other being perfectly healthy. The temperature at this time rises to about 101° in the evening, and generally falls again to below 100° in the morning. The appetite is often impaired, and the bowels are very apt to be relaxed, for children suffering from catarrh in any form are easily affected by the slightest chill, and therefore the sensitive intestinal mucous membrane is very frequently involved in the derangement. The presence of a caseous deposit in the lung seems to keep up an irritable condition of the whole mucous membrane, so that bronchitic rales of the dry variety are very frequently to be heard, and these often persist for a long time, although the general symptoms are undergoing progressive improvement.

### CASE XXIV.—CHRONIC CATARRHAL PNEUMONIA—RAPID ABSORPTION OF THE DEPOSIT.

William T., aged nine years, was born of a consumptive family on the father's side; the mother's family was healthy. The boy had had hooping-cough and measles, but recovered completely, and remained in good health until Christmas, when he began to cough, especially at night. Towards the end of January, after a severe wetting, the cough got worse, and he was thirsty and feverish; his appetite, too, began to fail, and he complained of pains in the chest and limbs. From that time he seemed to grow daily worse, until February 19, when he was admitted into the East London Children's Hospital.

On admission the boy was pale and rather thin. His sternum was a little prominent, and there was slight flattening in each infra-mammary region. The two sides expanded pretty equally. The heart's impulse was in natural site. Some want of resonance was found at the right apex, both before and behind, and the respiration was high-pitched and rather bronchial (with the mouth open). Sonoro-sibilant rhonchi were heard not only here but all over the right side, both at the back and the front, and also—although to a less extent—on the left side. With this exception, the physical signs generally were natural. Heart's sounds were healthy. The boy's temperature was always over 100° at night, and it sometimes rose to 101°. In the morning, after the first three days, it generally fell to 99°. During the first week the pulse varied between 102 and 108, but afterwards it became slower. The respirations were 28 to 30.

After the boy had been in the hospital a few days he began to perspire copiously at night, but the sweating was greatly diminished by half-drachm doses of tinct. belladonnæ given at bedtime. The physical signs gradually improved, and on March 18 the right apex was resonant except at the supra-spinous fossa, where the percussion-note was slightly high-pitched. Respiration, however, was natural. The dry rales still persisted over both lungs. The patient gained in weight. On March 3 he weighed 3 st. 11 1-4 lbs., and on March 18 4 st. 1 lb. After March 3 the temperature was always under 100° at night, and the respirations never rose higher than 26 in the minute. The boy left the hospital on March 28.

This case was one of chronic catarrhal pneumonia affecting the apex of the right lung. After the boy's admission into the hospital, absorption very quickly took place, and on his discharge there was left merely a little thickening of the tissue of the lung at the seat of disease. In this case, on account of the rapidity of its removal, it is unlikely that caseation of the deposit had taken place; for although it is probable that a cheesy mass may undergo absorption under favorable conditions (especially in a child), yet the process of removal must necessarily be slow.

When the catarrhal pneumonia is chronic from the first, the resulting consolidation is, as has been said, almost invariably seated at the apex of the lung. In other cases, however, where the solidification is the consequence of an acute inflammatory attack, whether of the croupous or catarrhal variety, other portions of the lung are frequently affected, and the base is very often the seat of disease. In this way any part of the lung may come to contain an unabsorbed deposit, which may set up phthisical changes, and lead to extensive disorganization.

When softening begins in a pulmonary cheesy mass, the change is indicated by the moister character of the crepitating or crackling sounds which accompany the respiration. Very soon the rhonchus assumes a metallic quality which is very noticeable, for pulmonary softening, when it has once begun in a child, usually proceeds with rapidity. The breath-sounds quickly become blowing and metallic, or even cavernous, while the resonance of the voice and cry is intensified and becomes bronchophonic. If the case have been from the first under observation, and the changes in the physical signs have been noted from day to day, the occurrence of signs such as the above, coming on gradually, and not succeeding to an acute inflammatory attack, indicates the progress of softening and ulcerative destruction of pulmonary tissue; but unless the successive steps of the process have been followed, as in the case supposed, the presence of dulness with cavernous breathing and gurgling rhonchus does *not necessarily* imply so serious a lesion of the lung. Acute and subacute catarrhal pneumonia frequently lead to considerable dilatation of bronchi; and a dilated bronchus, surrounded by solidified tissue, will give rise to exactly such physical signs as have been described. It is important in our diagnosis to distinguish clearly between these two conditions, for the ultimate issue of the case is likely to be very different, according as to whether actual breaking down of the lung be or be not in progress. In children the bronchi dilate with very great ease; and as in such subjects fibroid induration is readily set up, the dilatation is often a permanent one. Cases of prolonged phthisis with cavernous signs, where the child falls away during the winter, but begins to improve again and gain flesh on the return of more genial weather, are usually cases of this description. Such children often live for many years, dying eventually of pneumonia or other acute pulmonary attack.

The seat of the physical signs is an important element in the diagnosis. Thus, when occurring as a consequence of catarrhal pneumonia* dilated bronchi are much more often found towards the base of the lung than elsewhere, while ulcerating cavities are more frequently situated near the apex. Again, the general symptoms afford very valuable information. If the appetite is good, and the child is gaining flesh and strength, while the temperature is normal or only slightly elevated, we have good grounds for inferring that the cavernous signs are not due to ulcerative destruction of the lung. Besides, the tendency of ulcerating cavities is to extend themselves, that of dilated bronchi to contract. If, therefore, we find, as the days pass, that the cavernous sounds become less and less intense, and less widely audible, we may conclude that it is with the less serious lesion that we have to deal. The most conclusive evidence, however, is furnished by a careful microscopic examination of the expectoration. If this be found to contain areolar fragments of elastic tissue, the existence of ulcerative excavation of the lung is at once established. Unfortunately, in children, who generally swallow all sputa, this evidence is not often within our reach.

Cavities are not always indicated by such positive physical signs as have been described above. If they are seated near the surface of the lung, they probably always give rise to cavernous respiration, metallic bubbling rhonchus, and bronchophony; but in cases where they are more deeply seated, and are separated from the surface by tissue not completely consolidated, the evidences of their presence become much less distinct. Indeed, it is questionable whether a small cavity, seated in the middle of the lung, and not communicating with a bronchus of some size, can be discovered by any means of physical investigation at our command. It is certainly the case that a cavity may be present without giving rise to other signs than slight dulness, faintly bronchial breathing, a small bubbling rhonchus, and increased intensity of vocal resonance,—signs which are distinctive of nothing more than mere consolidation of the lung.

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* The statement in the text refers merely to cases of catarrhal pneumonia, and not to dilatations of the bronchi from other causes, such as fibroid induration of the lung.

Again, cavernous breathing of the most intense kind may be present, although there is no cavity. This phenomenon is sometimes to be found in cases of pleuritic effusion in the child. The diagnosis is made by noting the existence of the other signs of pleurisy. Where the lung is really the seat of excavation, effusion is rarely seen, for although pleurisy is common in such cases, it is almost always of the plastic variety, in which little or no fluid is poured out. Enlarged bronchial glands, by their conducting power, will give rise to loud blowing breathing at the apices of the lungs, and this may even acquire something of a cavernous quality. In such cases, however, the rhonchus, if present, is not metallic, and when the mouth is open the cavernous character of the respiration is much diminished. It must not be forgotten that enlarged bronchial glands may co-exist with cavities at the apices of the lungs.

The process of softening in a cheesy mass is not *necessarily* accompanied by any special severity in the general symptoms. The cough is often not much more frequent; the appetite may remain good; and even the weight of the body may be but little diminished. Usually, however, the process is accompanied by a very evident impairment of the general health. The beginning of softening is often indicated by high fever, flushings of the face, and morning perspirations; and in most cases the appetite fails, the temperature rises, the languor increases, the patient sweats profusely at night, and loses flesh unmistakably. Often at this time diarrhœa is set up, and the rapidity of the wasting is increased. Children seldom expectorate unless the cough causes vomiting; as a rule they swallow the sputum as it reaches the mouth. For the same reason hæmoptysis is rare * in the child, the blood being swallowed instead of expectorated. The digestion is deranged in most cases. There is usually considerable irritability of the stomach, and vomiting is easily excited.

The following case furnishes a good illustration of the symptoms and physical signs attending the breaking-down of a cheesy mass:—

CASE XXV.—CHRONIC CATARRHAL PNEUMONIA—SOFTENING AND EXCAVATION.

William P., aged two years, was attacked by measles on New Year's Day. About a week after the disappearance of the rash, his cough was noticed to be very violent; this was especially the case at night, when he would become feverish and get flushed in the face. After coughing he sometimes retched, but did not vomit. His appetite remained fairly good, but he was noticed to be losing flesh. On February 14 the child was admitted into the East London Children's Hospital.

On admission, the right side was found to be completely dull in front from the third rib to the base, but the dulness was less marked outside the nipple-line than between that and the sternum. Above, the natural resonance was rather diminished as far as the apex. The respiration just below the clavicle was high-pitched and slightly bronchial, but over the area of dulness it became markedly bronchial and rather metallic in quality, although not actually blowing. No crepitation or rhonchus was heard during quiet breathing, but a double metallic click was caught at the end of a deep inspiration. Elsewhere on the right side there was little remarkable about the physical signs: at the back the percussion-note seemed generally high-pitched, but the respiration was natural and there was no rhonchus. The left side was healthy. The temperature after the first evening was always under 100°, usually only 99°; pulse 108 to 126; respirations 30 to 54.

The boy went out on February 21, with no alteration in his physical signs, but he was re-admitted on July 11 with severe diarrhœa. At this time an examination of the chest showed dulness at the right apex, both before and behind, with increased resistance. At the right back, from the spine of the scapula downwards, the note was rather tympanic; respiration at the upper part was bronchial with moist clicking rhonchi. Over the rest of the right side there was some clicking and wheezing rhonchus, both in front and at the side. At the left back the percussion-note was generally high-pitched, but the respiration was natural, and no rhonchus was noted except at the base, where occasional bubbles were heard. At the left front the physical signs were natural. The child was now thinner and paler, and looked much worse than before. His temperature was over 100° at night, often rising as high as 102°, and one occasion to 103.8°; respirations 42 to 60; pulse 102 to 138. The cough was not violent, and was loose. The diarrhœa soon ceased under the influence of lead and opium, and the omission of milk from the diet. The cough, however, continued, and the child daily lost in flesh and strength.

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* It is, however, far from uncommon for children to eject blood from the mouth, but this is seldom the result of hæmoptysis. Children are very subject to attacks of epistaxis, and, according to the seat of the hemorrhage in the nasal cavity, the blood flows forward through the anterior nares, or backwards into the pharynx. If the latter, coughing is often produced, and large quantities of dark-colored blood are ejected, to the great alarm of the parents. In such cases we generally find, on inquiry that the nose has been bleeding, and blood may often be seen trickling down the back of the throat from the posterior nares. Sometimes the blood is swallowed, and is afterwards vomited.

On July 29 the dulness at the right apex was increased, and the breathing had become blowing in quality, with a large, almost gurgling, rhonchus. This rhonchus was heard all over the right side, both before and behind. At the right supraspinous fossa the respiration was cavernous. All over the left side a coarse, crepitating rhonchus was heard, which disappeared to a considerable extent after a cough.

On the evening of July 29 the diarrhæa returned with some severity. Temperature, 7 P.M., 101·8°; pulse 138; respirations 48. On the following morning the temperature was 98°, and the child died in the course of the afternoon.

On examination of the body, the right lung was found to be much diseased. The upper lobe, adherent in places to the chest-wall, was solid and of a dark purple color. Its substance was dense, and could not be broken down by the finger. The denseness was due to a large excess of fibroid tissue, for the divisions between the lobules were seen as greyish bands, and the walls of the bronchioles were thickened, although their channels were not dilated. Small cheesy masses were scattered through the substance of the lobe, and at the upper part was a cavity, the size of a walnut, whose outer wall was formed merely by thickened and greyish-colored pleura. At this point the lung had been adherent to the wall of the chest. The middle lobe was healthy. The lower lobe crepitated imperfectly, and was red in color. At the anterior border of the base there was a patch of consolidation, with two small cavities containing softened cheesy matter. The left lung was the seat of recent catarrhal pneumonia; old patches of cheesy matter were dispersed through the substance; no grey granulations were anywhere seen. The bronchial and mesenteric glands were enlarged, and the intestines—both large and small—were studded with transverse ulcers.

In this case the child had an attack of acute catarrhal pneumonia secondary to measles. As so often happens under these circumstances, absorption was carried on very slowly, and on the admission of the child into the hospital, between four and five weeks after the beginning of the inflammatory attack, there was considerable consolidation of the right lung. This consolidation was seated more at the base than elsewhere, but the incomplete resonance at the apex, together with the high-pitched and rather bronchial breathing heard below the clavicle, indicated that the upper part of the lung was not altogether untouched by the disease. The history of the case—for, as far as could be discovered, the child had been healthy before the attack of measles—showing clearly the nature of the illness. Catarrhal pneumonia is a frequent sequela of measles; and the presence of acute tuberculosis, the other common consequence of rubeola, was excluded by the strict limitation of the pulmonary physical signs to one side of the chest, for catarrhal pneumonia occurring secondarily to acute tuberculosis would certainly give rise to symptoms in both lungs. The temperature at this time was not high, being usually below 100° in the evening, and under favorable conditions the case might not improbably have done well. The child's friends, however, removed him from the hospital, and on his readmission, five months afterwards, the disease was found to have made great progress. Absorption of the deposit had taken place to a certain extent towards the base of the lung, but at the upper part chronic catarrhal changes had evidently been going on, so that there were distinct evidences of consolidation and softening at the right apex. The temperature was now high, and there was diarrhœa, which, by its depressing influence upon general nutrition, still further diminished any chances of recovery that might have remained. The case now went on rapidly from bad to worse. In a few days signs of excavation became apparent: the diarrhœa which had been arrested, returned; and the child sank and died.

It would have been difficult in this case to exclude secondary tuberculosis at the time of the child's readmission to the hospital in July. The character of the physical signs made it evident that the opposite lung had become affected, and there was nothing in the case at this period incompatible with the presence of the grey granulation. Still, the formation of secondary deposits in different parts of the body, and of ulcerations in the bowels, may occur in such cases quite independently of tuberculosis, and there was therefore no need to resort to this explanation of the general symptoms. It is a point worthy of notice in passing, that a diarrhœa resulting from so serious a lesion of the bowels could be arrested for a time by treatment, although there is no reason to suppose that any attempt at repair had taken place in the intestinal ulcers.

In the following case the disease was the direct result of an acute attack of catarrhal pneumonia, the deposit failing to be completely absorbed. The cavernous signs were not, however, produced, as in the preceding instance, by ulcerative destruction of lung, but were the consequences of a much less serious lesion. The case furnishes a good illustration of a condition which is far from being uncommon, and is one in which accuracy of diagnosis is of the utmost importance in estimating the probabilities of a favorable termination to the illness.

### CASE XXVI. CASEOUS CONSOLIDATION WITH DILATATION OF BRONCHUS.

William C., a thin, pale boy, aged fourteen years, but looking very much younger, was admitted into the East London Children's Hospital on November 20.

On stripping the boy for examination, the sternum was seen to be prominent, especially at the lower part, and the chest was contracted laterally at the base, showing the existence of a certain amount of permanent collapse of the bases of the lungs from successive catarrhs. The respiration was rather laborious, but the two sides of the chest moved equally, and the intercostal spaces of each side sank in. The percussion-note was high-pitched at the right supraspinous fossa, but the breath-sounds there and all over both sides were quite concealed by a profuse crepitating rhonchus, which on the right side was hard, metallic, and ringing; and this quality became more marked as the stethoscope was moved towards the base. The resonance of the voice was natural. In front there was no dulness on either side, except a slight want of resonance above the right clavicle; but a bubbling rhonchus was heard more or less copiously on both sides. The vocal fremitus was everywhere strong; temperature 101.8°; pulse 120; respirations 46.

On November 24, in addition to the want of resonance at the right supraspinous fossa, there was slight dulness at the right posterior base, and here the respiration was tubular. The same crepitating rhonchus was heard all over both sides posteriorly, changing at the right base to loud metallic gurgling. Over the upper part of the right back the respiration was bronchial. Temperature (8 a. m.) 103.6°; pulse 120; respirations 48; temperature (9 p. m.) 102.6°.

After this report the dulness at the left posterior base still further increased. On December 1 the want of resonance extended upwards as high as the spine of the scapula. Over the dull area the respiration was cavernous, with fine metallic bubbling rhonchus and bronchophonic resonance of the voice. The signs of general bronchitis persisted, for there was still much fine subcrepitant rhonchus at the left back. The signs of consolidation of the right apex remained unaltered. By this date the fever had become much reduced, and the temperature was only 99.6° both morning and evening; pulse 120; respirations 36.

The temperature remained between 99° and 100° until the evening of December 9, when it rose suddenly to 104.2°, and on the following evening was 105.2°. After this date, however, it again sank, but very gradually, and on the evening of December 21 was 98.8°. The elevation of temperature, which was no doubt due to a return of the catarrhal inflammation, was accompanied by an increase in the amount of subcrepitant rhonchus, but with no extension of the dulness or other alteration in the physical signs. There was still the same evidence of slight consolidation at the right apex, and at the base the dulness still reached as high as the angle of the scapula. The respiration was here cavernous as before, with metallic bubbling and intensely bronchophonic resonance of the voice. The dulness did not extend into the infra-axillary region. All over the right front a crepitating rhonchus could be heard.

The boy's general health began now greatly to improve. His appetite became very good, and he grew rapidly fatter. The temperature remained little higher than normal, rising sometimes to 100°, but, as a rule, maintaining a regular level of a little over 99°. His cough was loose, and not distressing. Towards the end of December he began to perspire profusely at night, but the sweats were controlled by a draught containing tincture of belladonna given at bedtime.

Little alteration was noticed from day to day in the physical signs. The rhonchus varied somewhat in quantity, and the respiration at the right base behind was sometimes more markedly cavernous than at others, owing, no doubt, to the varying quantities of secretion in the lung at that spot. Alterations in the vocal fremitus and in the resonance of the voice seemed to be dependent upon the same conditions. Towards the end of January the dulness at the right back began to diminish in extent. Instead of reaching upwards to the angle of the scapula, it became limited to the extreme base. Thus, on February 12 the physical signs were the following:—Percussion-note still high-pitched at right supra-spinous fossa, and dull at extreme base; but the dulness is, as before, limited to the back. All over the right back a loud crepitating rhonchus is heard, which at the base becomes larger, harder, more ringing, and more superficial. Respiration at the base is cavernous, but not very loud, and at the supra-spinous fossa is bronchial. Ordinary bronchitic rales are heard at the left back and in front on the right side. Vocal fremitus to-day rather diminished at right posterior base. 8 a. m.: Temperature 98.2°. 6 p. m.: Temperature 99.2°.: pulse 96; respirations 52.

The boy left the hospital on March 8, looking fat and well. The high-pitched percussion-note still persisted at the right supra-spinous fossa, and there was still dulness at the right base behind. The auscultatory signs were exactly the same as at the last report. Temperature (7 p. m., March 7) 99.6°.

On April 30 the boy came to the hospital for examination. The physical signs were now very much the same as before. Both sides expanded fairly well and equally. There was still evidence of consolidation at the right apex, and at the base the dulness persisted, and the respiration was cavernous, with a sharp crepitating rhonchus not removed by coughing. Vocal resonance at base bronchophonic. The crepitation was heard more faintly in the infra-axillary region, but the respiration there was exeessively weak. Very little rhonchus was heard elsewhere, and the left side appeared to be quite healthy. The boy looked very well, and was fat. He coughed occasionally, but expectorated nothing. The finger-ends were not clubbed.

This patient on his admission was evidently suffering from a chronic consolidation at the apex of the right lung, with secondary acute catarrhal pneumonia. There was slight dulness at the right supra-spinous fossa; but the breath-sound was not tubular, as it would have been in a boy of his age if the consolidation had been recent. The high temperature showed that the crepitating rhonchi heard about the back were not due merely to bronchitis, and although there was no loss of resonance over the back generally, yet the metallic quality of the rales on the right side—a quality which became still more marked towards the base—indicated the presence of deposits in the lung. The pneumonic process continued, and a few days afterwards evident dulness could be detected at the right posterior base, with all the signs of pneumonic consolidation. Cavernous signs soon began to manifest themselves, and in a short time it became evident, from the loud cavernous respiration, the metallic gurgling, and the bronchophony, that the base of the right lung was the seat of a cavity of some size. It was necessary to determine the nature of this cavity, for the prognosis depended greatly upon an accurate estimate of the pathological condition of the lung. The temperature and general symptoms here furnished important information. At the very time when the cavernous signs became fully developed the temperature fell considerably, and at the same time the respirations, which had been 48 in the minute, sank to 36. A change so favorable was sufficient to exclude softening and breaking down of a recent deposit, for such rapid destruction of lung-tissue, instead of an amelioration, would have caused a serious increase in the severity of the general symptoms. Besides, the cavernous signs were seated at the base of the lung—a comparatively unusual situation for a cavity, although common for a dilated bronchus; and the signs had supervened upon an attack of catarrhal pneumonia where the development of a bronchiectasis is so often met with. These reasons were sufficient for concluding that the signs were due to a cavity formed by the dilatation of a bronchus. The after-progress of the case confirmed the conclusion arrived at; the condition of the boy improved greatly, the appetite returned, he gained flesh fast, and rapidly resumed the appearance of health, although the physical signs suffered little alteration, and some considerable consolidation, with all the signs of a cavity, remained as a persistent condition.

It is remarkable in this case how little change was induced in the chronic consolidation of the right apex by this attack of catarrhal pneumonia. A certain amount of bronchitic rhonchus was heard there as in other parts of the chest, but no extension of the consolidation took place at this spot, and no active change in it was induced by the presence of the catarrhal condition. Such a consolidation forms a good illustration of the inactive cheesy deposit which reveals itself by physical signs, but does not affect the general condition of the patient, and gives rise to no constitutional symptoms.

A caseous deposit may remain a long time unabsorbed, and yet may finally disappear; indeed, in children it is difficult to fix a limit beyond which its removal by natural processes can no longer be looked for. In the adult a deposit rarely becomes absorbed after the expiration of three months, but in young subjects this term must be greatly extended, and, provided the deposit remain completely inactive, a much longer time must elapse before absorption can be pronounced to be impossible. The occurrence of pleurisy with effusion on the diseased side appears to favor a healthy removal of caseous consolidations; and a case has already been related in a previous chapter where the physical signs of consolidation of some standing completely disappeared on the absorption of the effused fluid (see case of Emma W., page 81). This, however, is only true of cases where the deposit is perfectly inert, without any active change taking place in it. If the mass excite irritation in the tissue around, or if softening have begun to invade the deposit, the occurrence of pleurisy appears to exercise a very injurious influence upon the disease.

The presence of caseous masses in the lung often leads to the formation of the true gray granulation in the body, and cases frequently terminate in an outbreak of acute general tuberculosis.

### CASE XXVII.—CHRONIC CATARRHAL PNEUMONIA WITH PLASTIC PLEURISY AND SECONDARY ACUTE TUBERCULOSIS.

Edwin S., aged two years, was admitted into the East London Children's Hospital on March 8. He had been ill for eight weeks. The illness began with an eruption like urticaria and he was feverish at night. The next day he began to cough and his bowels were relaxed. He was seen by a doctor, who said he had inflammation of the lung. Since then he has been poorly, very restless, and has slept badly at night. Breathing sometimes labored; not much cough. Motions have sometimes contained thread-worms.

STATE ON ADMISSION.—A small child, pale and thin; features large and coarse; complexion thick; eyelashes long; eyebrows well marked; a little eczema of nostrils; no enlarged cervical glands; and no appearance of hair on shoulders or along spine. Hands rather old, and nails livid. Finger-ends slightly clubbed. Lips a little dry. A little dulness at right supra-spinous fossa; respiration there bronchial, with a little crepitating rhonchus heard during inspiration. Bowels slightly relaxed, and motions offensive. Temperature at night 104.4°.

The dulness at the right apex gradually increased after the child's admission; the respiration became loud and blowing, and the physical signs were noticed in the front as well as at the back. On March 19 some clicking sounds were heard at the end of inspiration, from the clavicle as far down as the nipple, and also in the axilla. By the 23d the percussion-note had become high-pitched over all this area. During the next few days the resonance still further diminished, and on March 30 the percussion-note was completely dull from apex to base at the right front, and the respiration was cavernous, without rhonchus. Over the rest of the right side the natural resonance was impaired; the breath-sound was loud and cavernous in the axilla, and bronchial behind. At the posterior base an occasional click was caught at the end of inspiration. The pulse-respiration ratio was little altered at this time. On March 18, pulse 130, respirations 30; on March 23, pulse 104, respirations 32; on March 29, pulse 120, respirations 32; and on April 1, pulse 128, respirations 36. The child could not be persuaded to speak, and therefore the state of vocal resonance and the presence or absence of vibration of the chest-wall could not be ascertained. Heart's apex was immediately below and to the left of the left nipple. On the left side the physical signs seemed everywhere perfectly natural.

The child was evidently getting weaker and thinner. On March 15 he weighed seventeen pounds, and on March 30 sixteen pounds one ounce. His face was colorless, with an expression of distress. The bowels were occasionally relaxed, and his appetite was poor. The temperature was rarely under 100°, and in the evening usually rose to 101° or higher.

On March 29, temperature at 8 a. m. 100.2°, 7 p. m. 101.8°; pulse 120; respirations 32.

After this report the physical signs continued much the same. The dulness remained limited to the front of the chest on the right side, and the resonance laterally and at the back was little diminished. Posteriorly, the only marked dulness was at the supra-spinous fossa. Everywhere over the upper half of the chest the breath-sounds were loud and cavernous, without rhonchus even after a cough.

On April 2 the chest was punctured with the hypodermic syringe, but no fluid escaped.

On April 6 the signs were unaltered, except that the percussion-note in front had become rather tubular in quality, and a fine crepitation was noticed at the end of a deep breath immediately below the clavicle, and also at other parts of the chest. At the right supra-spinous fossa some large metallic bubbling was heard, and the respiration there and all over the upper half of the right side was loud and cavernous. Nothing abnormal was discovered on the left side of the chest. The temperature remained high, as before.

After this date the only alteration in the physical signs was a greater intensity in the cavernous respiration. The crepitation varied in quantity, and was sometimes absent altogether; when heard it was always fine. There was no approach to metallic gurgling rhonchus, and the only large bubbling heard was at the right supra-spinous fossa. The left side of the chest never at any time gave evidence of disease.

The child did not waste persistently. On April 21 his weight was seventeen pounds thirteen ounces, being a gain of nearly two pounds during the previous three weeks; on April 29 he weighed eighteen pounds; and on May 6 eighteen pounds six ounces. On this day, however, a severe attack of diarrhœa came on; rapid wasting then set in, and the boy died on May 12.

On examination of the body, the right lung was found attached by easily separable recent adhesions to the chest-wall. The two upper lobes were solidified; the lower, although firmer than natural, still crepitated to a certain extent. The surface of the whole lung beneath the pleura was dotted over with minute pearly specks, evidently gray granulations. On section, the upper lobe was found to be infiltrated with softening cheesy matter, and contained several small cavities, of which one at the apex was as large as a nutmeg. The middle lobe consisted of small yellow nodules, separated by firm inflamed tissue. The lower lobe (red, and more solid and friable than natural) contained no cheesy masses; many small grayish-yellow points (gray granulations) were sprinkled over the cut surface. The left lung, partly adherent at the base, contained many yellow nodules, very closely aggregated in the upper lobe, none of them softening. Gray granulations were numerous in this lung. They were also seen on the surface of the liver and spleen. The intestines contained no ulcers.

In this case the acute tuberculosis was in all probability secondary to the consumptive disease. The illness began suddenly with fever and cough, and the medical practitioner who was called in pronounced the case to be one of inflammation of the lung. The child presented many characteristics of the so-called scrofulous diathesis; the large, coarse features, and thick complexion; the long eye-lashes and strongly-marked eyebrows; the eczematous eruption about the nares,—all indicated a state of constitution favorable to caseous degeneration, and therefore one in which the absorption of a pneumonic deposit might be expected to be slow and incomplete. On the child's admission there was still some evidence of consolidation at the apex of the right lung, and this during the next few days became more marked. The temperature at this time was higher than the normal level, showing that the inflammatory process was not yet at an end. Shortly afterwards there was a rapid extension of the physical signs, and in the course of a few days all resonance completely disappeared from the front of the affected half of the chest, and even the resonance laterally and at the back was appreciably

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diminished. The occurrence of dulness had been preceded by clicking sounds, very superficial, and appearing to be generated immediately underneath the thoracic wall. This superficial character of the sounds, together with the sudden cessation of all rhonchus when the dulness was established; the rapidity with which resonance was lost; and the manner in which the change occurred—the dulness not traveling from the apex downwards, but involving at once the whole right front of the chest down to the extreme base—these facts, combined with the character of the precussion-note, which was completely dull, and the little alteration in the ratio between the pulse and the respiration, seemed to indicate that the diminution in resonance was not due to any sudden extension of the pulmonary consolidation, but resulted from the presence of pleuritic exudation. The pleurisy was shown to be the plastic variety, as was shown by the limited distribution of the complete dulness. If fluid had been present, the loss of resonance would have been as complete at the back as at the front, unless, indeed, the pleurisy had been localized and the gravitation of fluid had been prevented by pleuritic adhesions. That the pleurisy was general, and not local, was indicated by the perceptible alteration of the percussion-note at the back, although the dulness was much less complete posteriorly than in the front. In order that no doubt might remain as to the absence of fluid, the chest was punctured with the hypodermic syringe, but nothing escaped.

The softening of the cheesy consolidation at the apex of the lung went on rapidly; the breath-sounds soon became cavernous, and large metallic bubbling rhonchi were heard at the supra-spinous fossa. The final attack of diarrhœa occurred rather unexpectedly, and carried off the patient before the symptoms of the secondary tuberculosis had become sufficiently developed to allow of the diagnosis of the complication. The grey granulations found on inspection of the body were probably of very recent origin; and, no doubt, had the child lived a few days longer, some evidence of their presence would have been discovered in the left lung. In this lung some unsoftened cheesy nodules, and many fine grey granulations were found, but no irritation appeared to have been excited by their presence in the organ. It is remarkable that this child, although the subject of so exhausting a disease, and although suffering from so much pyrexia, did not lose flesh. On the contrary, the weight of his body increased from 16 lbs. 3 oz. on his admission to 18 lbs. 6 oz. on April 29, when the attack of diarrhœa occurred which put an end to his life.

The diagnosis of chronic catarrhal pneumonia is more difficult in the child than it is in the adult. This arises partly from the physical peculiarities of children before referred to, partly from the frequent occurrence of wasting in early life independent of organic disease. and partly from the readiness with which a slight cough may be induced in young subjects by irritation of distant organs,—so that this symptom becomes a common complication of other complaints. A child may waste for a considerable time, and be troubled with a teasing cough, without being the subject of chronic pulmonary disease; and although pulmonary consumption is always feared in such cases, the most careful examination of the chest may reveal nothing to encourage our suspicions, In the condition which I have elsewhere described under the name of "mucous disease,"* a hacking cough is a common symptom, and this may continue for months without being followed by disease in the lung. Elevation of temperature, combined with the above symptoms, is a very important addition, and, if persistent, at once marks the case off from the ordinary forms of wasting disease. Whenever fever is present it is necessary to assure ourselves of the absence of common sources of irritation which might give rise to pyrexia. Thus, the mouth should be inspected for signs of aphthæ or inflammation of the gums. Dentition produces a rise in temperature which may persist for weeks together; but here the pyrexia is very irregular, and the temperature rises much higher than is common at the beginning of chronic catarrhal pneumonia, being often as high as 104° or 105° in the morning. In children between five and six years old, such a cause of fever is often seen, and at this age wasting from mucous derangement of the bowels is most frequently met with. In these cases, therefore, the gums should be looked at, and will often be found to be tense and swollen over the position of the back molars, which are the first teeth of the second crop to make their appearance. Still, it must not be forgotten that any of these causes of pyrexia may be complications of the pulmonary complaint.

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* See "Wasting Diseases of Infants and Children," second edition, [illegible]

Whenever catarrhal pneumonia is suspected, the chest should be examined repeatedly for signs of disease. Such signs, to be trustworthy, must be positive. The degree of expansion in a child's lung is so variable, especially at the apex, that a distinct dulness must be required; and this dulness must be found to persist for several days in succession before we can be sure that we are not deceived by insufficient expansions or temporary collapse.

It is often more difficult to distinguish between the beginning of catarrhal pneumonia, when the inflammation spreads gradually from the smaller tubes to the terminal vesicles, and cases of acute tuberculosis. In the latter case the loss of flesh is much greater than in the former, and on careful inquiry the pyrexia and wasting will be found to have preceded the cough, the general symptoms appearing before the local. In catarrhal pneumonia the local symptoms are the first to appear, and, unless the case has been complicated by some other form of wasting disease, there is a history of cough, and perhaps of shortness of breath, for some time before the general nutrition of the body began to suffer. Besides, in acute tuberculosis the course of the disease is rapid, the face at an early period wears a pinched, haggard expression, and the child has the appearance of one seriously ill.

In a more advanced stage of catarrhal pneumonia, when the signs of consolidation are pronounced, the diagnosis is easy. Dulness, bronchial breathing, and crepitating rales confined to the upper part of the lung on one side of the chest; the other lung being perfectly free from disease;—these signs found in a child the subject of a chronic cough, and in whom general nutrition, although impaired, is still fairly performed, may be safely attributed to chronic caseous consolidation. If, instead of the apex, the consolidation be seated at the base of the lung, the case has to be distinguished from empyema. It is rare for a chronic consolidation to be mistaken for empyema, but empyema, when accompanied (as it often is) by great emaciation in children, is constantly mistaken for "phthisis." The diagnosis is made by referring to the history of the case—pleurisy almost invariably beginning with sudden and severe pain in the side, followed after some hours by a cough,—and by noting the character of the physical signs. If the dulness be due to fluid, it is found at the front of the chest as well as at the back. The percussion-note is generally tubular under the clavicle of the affected side, and the respiration is either very weak, or is bronchial, blowing, or cavernous, without rhonchus. In addition, the outline of the diseased half of the chest, as taken by the cyrtometer, is found to have become more or less square-shaped, and the heart is displaced. If there be any vocal vibration on the healthy side, it is lost over the seat of disease. For a fuller discussion of the diagnostic characters of pleurisy, the reader is referred to a previous chapter.

When the case has advanced to the stage of ulceration and cavities have formed in the lung, we have still to satisfy ourselves that the cavities are really the result of destruction of tissue, and are not mere dilatations of bronchi. The means by which this distinction is arrived at have been already pointed out.

The probabilities of absorption in a case of a pulmonary cheesy mass are not easy to estimate. Much will depend upon the mode of formation of the deposit, upon the constitutional condition of the patient, and upon the general influences which can be brought to bear upon the complaint. As a rule, the more rapidly a deposit has formed the greater is the probability of its safe removal, and therefore, in cases where the consolidation has resulted from an acute attack, the prognosis is more favorable than in cases where the disease has run a slow course from the first. The longer, however, the deposit remains unabsorbed, the fainter becomes the prospect of its disappearance; and although, in children, absorption may occur at a later period than is common in the adult, yet if months pass by without any alteration in the physical signs, it is unlikely that the affected lung will ever return to a completely healthy condition. The influence of the so-called scrofulous diathesis is no doubt to favor the occurrence of catarrhal processes, and also to determine an early caseation of pulmonary deposits. Therefore, in children who present the characteristic marks of this type of constitution, any delay in the resolution of a pneumonic consolidation should be regarded with especial anxiety. So, also, in children with narrow contracted chests and feeble resisting power, the liability to pulmonary catarrh and the tendency of such catarrhs to become obstinate should not be lost sight of.

When the softening has begun in the deposit, the case assumes a very grave aspect, and as at this time the opposite lung is apt to become affected, recovery now can hardly be looked for. Still, under favorable conditions, the further progress of the disease may be greatly delayed. Persistent elevation of the temperature (other causes of pyrexia being excluded) is a very unfavorable sign, especially if combined with steady loss of flesh; but even these cases do not always run an uninterrupted downward course, and there are often intervals of improvement, or, at any rate, periods during which the disease seems to be stationary. The occurrence of acute attacks of catarrhal pneumonia is necessarily dangerous, but the immediate effects are not always so serious as might be supposed, although the inflammatory attack seldom subsides without leaving behind it some addition to the original disease.

The occurrence of fibroid induration is to be welcomed as one of the favorable modes of ending a cheesy deposit, for this change, if not always equivalent to a cure, is yet one which, with proper care, will greatly prolong the patient's life.

In cases of bronchial catarrh, when we have reason to believe that the inflammation is extending from the smaller tubes to the air cells, treatment should be prompt and active. The child must be at once confined to bed, hot linseed-meal poultices should be kept applied to the chest, talking must be forbidden, and saline remedies should be ordered, with small doses of antimonial wine to promote free secretion from the bronchial tubes. By this means the disease is often at once arrested, and after a few days, the pyrexia having subsided, the patient is able to return to his usual habits.

If the child be first seen after the formation of a pulmonary deposit we may hope that the cheesy mass, so long as it remains inactive, may yet be absorbed. To favor its removal we should endeavor as much as possible to alter the conditions of existence under which nature had failed to restore the lung to a healthy state. If it can be done, we should send the patient into the country, choosing some elevated spot where the soil is porous and the air dry and bracing. Dryness of the air is a very important point, and, therefore, an inland district is more to be recommended than the seaside. The spot selected should, if possible, be sheltered from the north and east. The child should be warmly dressed, and should pass as much time as possible out of doors. In the house every care should be taken to keep the air sweet and pure; in fact, a liberal supply of pure, dry air is one of the most important curative agents we have at our command.

The diet of the child should be regulated with great care; he should take plenty of meat and milk, but starchy food, sugar, and all such fermentable articles of diet, are to be allowed sparingly. It is of extreme importance in these cases to keep the digestive organs in the highest state of efficiency, and, therefore, the tendency to acid fermentation of food, which is one of the peculiarities of early life, must not be encouraged by overloading the stomach with farinaceous food and saccharine matters. For the same reason, summer fruits are to be given with caution, and should not be allowed late in the day. It is important that the child take plenty of liquid, so as to favor local absorption; and in order that the digestion of food may not be disturbed, it is wise to accustom the child to drink freely of some harmless fluid at an interval between the meals.

A careful watch should be kept over the bowels, and the earliest appearance of looseness should be met by suitable treatment. The best medicines are the alkalies, and they may be usefully combined with iron and arsenic. Thus, the bicarbonate of potash or soda may be given with the citrate of iron and ammonia, or of iron and quinine, and a few drops of Fowler's solution of arsenic may be added. Arsenic, it must be remembered agrees well with children, between the ages of five or six and twelve it may be given to them in larger doses than are readily borne by the adult. Cod-liver oil—especially Dr. De Jongh's—can also be given, In cases where the appetite is bad, and the great difficulty is found in persuading the child to take food, alkalies are again of service. Ten grains of bicarbonate of soda given three times a day with two drops of dilute hydrocyanic acid (B.P.) in a dessert-spoonful of some bitter effusion, such as chiretta, will often quickly restore the appetite after dilute nitric acid and quinine have been tried without any improvement. As a local application much benefit results from painting the chest over the seat of disease with linimentum iodi, and this should on no account be omitted.

When the occurrence of pyrexia announces that irritation is set up in the system by the presence of the pulmonary deposit, the child should be put to bed, or at any rate confined to one room; his chest should be well poulticed, and at the same time efforts should be made to reduce the temperature by suitable medicines. Arsenic, alone or in combination with quinine, is very valuable for this purpose, and a mixture containing quinine, digitalis, and opium, on the principle of the pill recommended by Niemeyer, can often be given with very striking results. While the pyrexia continues, the child should be kept as quiet as possible. He need not be confined to bed after the first few days, but every care should be taken to avoid chills, and to keep him as much as possible in an equable temperature. The hypophosphites, especially the hypophosphite of lime, are often very useful in these cases, while pyrexia is high; and when softening has begun in the deposit the influence of these remedies is often very remarkable. It is at this time, too, that cod-liver oil is of especial value, and should always be given if it can be borne.

If the cough is troublesome, special medicines must be used to control it, but care should be taken not to derange the digestion by opiates, or to irritate the bronchial mucous membrane by the untimely use of stimulating expectorants. The principles which govern the treatment of an ordinary bronchial catarrh, apply equally to cases of chronic pulmonary disease. A hard cough is only made harder by ammonia and squill; and opium, although it may for a time deaden the desire to cough, will not relieve the irritation of a congested and swollen mucous membrane. In such cases, alkalies, with small doses of antimonial and ipecacuanha wines, should be prescribed to relieve the loaded vessels; and it is only when the cough has become perfectly loose, and all oppression of chest has passed away, that bronchial stimulants and small doses of morphia can be permitted.

In the later stages of the disease, when our only object is to relieve painful symptoms, we must watch carefully over the digestive organs and the state of the bowels. The distressing sickness, which often occurs at the end of a paroxysmal cough, is best controlled by solution of arsenic in one-drop doses combined with pernitrate of iron, and small quantities of morphia; or, failing that, by the application of a very small blister under the clavicle of the side principally affected. If hæmoptysis occurs, the liquid extract of ergot should be given at once, with (if the bowels are not ulcerated) laxative doses of Epsom salts; and perfect quiet should be enforced. In all cases of hæmoptysis the quantity of fluid taken at one time should be considerably restricted, so that the vessels may not be exposed to any sudden strain from the rapid absorption of large quantities of liquid. Night-sweats are best subdued by belladonna given at bedtime, and in prescribing this medicine the remarkable tolerance of children for this drug must not be forgotten. For a child four years old the night draught should not contain less than twenty drops of the tincture.

Intercurrent attacks of acute catarrhal pneumonia should be treated by confining the child to bed, enveloping the chest in hot poultices, and keeping up the strength by the judicious administration of stimulants. For a child the best stimulant is the brandy-and-egg mixture of the Pharmacopœia.

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## CHAPTER VII.—FIBROID INDURATION OF THE LUNG (CIRRHOSIS).

PATHOLOGY—The disease always a secondary one—usually a consequence of catarrhal pneumonia or pleurisy.
Fibroid phthisis.
Case XXVIII.—Fibroid thickening of lung following an attack of catarrhal pneumonia—Comment.
Symptoms and physical signs.
Case XXIX and XXX.—Fibroid induration of apex of lung, with contraction of chest—Comment.
Case XXXI.—Extreme fibroid induration and contraction—Comment.
Case XXXII.—Extreme fibroid induration with great dilatation of bronchi, but without contraction of the chest—Comment.
Case XXXIII.—Fibroid induration with extensive excavation of lung—Comment.
Diagnosis of fibroid induration—Prognosis—Treatment.

FIBROID induration of the lung is a disease which is frequently met with in

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the adult, and has been often described. In children, being less common, it has received comparatively little notice, but it is not the less interesting and important.

The disease consists in a gradual thickening of the partitions between the air-cells by a dense fibroid tissue, which forms an interlacing network, spreading in all directions through the alveolar walls. Sometimes fibro-nucleated growths can be detected, but these are often absent, so that the induration has been described as depending upon the infiltration of an amorphous substance between the interstices of the alveoli. After a time the new material shrinks, contracting the lung and dilating the bronchi. In the densest parts the air-vesicles may be completely obliterated by the new fibre-formation and its accompanying contraction ; and the cut surface of the lung is then seen to be smooth, shining, firm, hard, and non-granular. It is traversed by whitish bands, which are the thickened interlobular septa, and by thickened bronchi, whose channels are sometimes dilated, sometimes nearly or even quite obliterated by the new fibrous growth. In this stage the varying amounts of black pigment give to the surface a grey, marbled appearance, which is very peculiar and characteristic. The indurating process is not confined to the interlobular septa, but attacks also the walls of the vesicles in the interior of the lobules. It is associated with an accumulation within the vesicles of nucleated and epithelial cells, granular corpuscles, and granules—the result of an accompanying inflammatory process. Some pathologists are disposed to look upon the new fibroid tissue as a modification of the grey granulation. The complete dissimilarity in the clinical characters of the two diseases is, however, hostile to the ready acceptance of such a theory. Fibroid induration in young subjects seems to be always a secondary lung affection ; and the diseases to which, in the large majority of cases, it is found to succeed are catarrhal pneumonia and pleurisy.

Catarrhal pneumonia in children is apt to assume a subacute character, especially when it occurs in the course of measles and whooping-cough. Bronchial dilatation is also a common accompaniment of this form of inflammation of the lung ; and the presence of bronchiectasis seems to have the effect of prolonging the course of the inflammation and delaying its resolution. It seems probable, too, that dilatations of the air-tubes continuing after the subsidence of the catarrhal disease, tend to excite a recurrence of the inflammatory process, and to increase the fibroid thickening. The dilatations become filled with secretion, which they are unable to expel. The retained secretion putrefies, and excites great irritation of the surrounding tissue. A localized catarrhal pneumonia is set up, and the inflammatory process runs a tedious course on account of the continued irritation produced by the decomposing contents of the tubes. By this means the fibroid thickening is increased, and frequent recurrence of these attacks may lead to extensive induration of the lung. In some cases the irritation excited by the retained and fetid sputa may be so great that ulcerative destruction of tissue is set up, starting from the bronchial tubes. The disease in this form has been named "fibroid phthisis" by Dr. Andrew Clark.

Pleurisy is the other cause to which many of these cases of fibroid lung disease may be attributed. In such cases the lymph appears, as it were, to creep into the lung, and the induration extends inwards from the pleura.

The following case offers an illustration of an early stage of the disease, and shows the influence of catarrhal pneumonia in producing thickening of the fibrous tissue of the lung.

### CASE XXVIII.—FIBROID THICKENING OF THE LUNG, FOLLOWING AN ATTACK OF CATARRHAL PNEUMONIA.

Charles S., aged six years, was admitted into the East London Children's Hospital, under the care of Dr. Bruce on November 18. He came of a healthy family, and all his brothers and sisters were alive and well, except one who had died of diarrhœa. The boy had never had pertussis or measles, but had been for three years subject to a frequent cough. Two years before, he had had an attack of scarlatina. Since that time his cough had been more troublesome, and he had occasionally expectorated mucus tinged with blood. During the last six months he had been losing flesh, and for a month before admission had complained of pains in the left breast and epigastrium, which were increased by taking food.

On admission there were no very positive physical signs. The percussion-note at the whole of the right back was thought to be too high-pitched, and the same was noticed in the left axillary region, but there was no positive dulness. Elsewhere the note was healthy. The respiration everywhere was normal, and dry rhonchi were heard generally about the back.

Very shortly after admission the boy began to improve. His cough diminished, and he was allowed to leave his bed. The temperature varied in the evening from 100° to 101°, and his breathing was uniformly high, ranging from 40 to 48; but the appetite was good; he seemed cheerful, and did not appear to suffer much inconvenience from his illness.

On December 18 he caught cold. His cough became more severe, and the temperature rose in the evening to 102°. The pulse also became quicker, and the breathing accelerated. On the next evening (December 19) his temperature was 102.6°, the pulse 126, and the respirations 54; and from that date until December 27, when my attention was first directed to him by the house-surgeon, his evening temperature varied from 103° to 104.8°, his pulse from 126 to 156, and his respirations from 48 to 66.

On December 27 the following note was taken:—Boy rather small for age, but in tolerably good condition. Chest well formed, limbs straight, fingers distinctly clubbed. Lies in bed with head low; face flushed; nares acting; pulse 140; respirations 68, but respiratory movements not at all labored, and no signs of dyspnœa; temperature in rectum 103.2°.

The right side of the chest moves more freely than the left. Heart's apex at fifth interspace in nipple line. The percussion-note is dull over the whole of the left side of the chest, but the dulness is greater below than above. Thus, in front complete dulness begins at third rib; behind at the spine of the scapula; and laterally dulness is only complete in the infra-axillary region. Resistance is only moderately increased. Vocal fremitus can be felt indistinctly, and rhonchal fremitus is strong over the whole left back. With the stethoscope a subcrepitant rhonchus is heard all over the side with both inspiration and expiration. Above, it is coarse, but becomes finer towards the base, where it is mixed up with a sibilant rhonchus. The loudness of the rhonchus renders the breath-sound indistinct above, but from the angle of the scapula to the base the respiration is loud and intensely tubular, with bronchophonic resonance of the voice, and also at a spot a little to the inside of the nipple it is tubular although less loud. The right side of the chest appears healthy except at the base behind, where the percussion note has a wooden quality, and the respiration is blowing, with subcrepitant rhonchus. At the right supra-clavicular region also the percussion-note is a little high-pitched, but the breathing is natural. An occasional sibilant creak is heard over the right front.

On December 31 there were distinct evidences of consolidation of the right apex. Percussion was dull both above and below the clavicle, and also at the supra-spinous fossa. At the latter spot the breathing was weak, with sibilant rhonchus and coarse crepitation, while in front it was harsh, with a sibilant wheeze. At the right base behind there was also some dulness, and the respiration was faintly tubular, with coarse crepitation.

The left apex seemed, on the contrary, to be clearing, for the percussion-note at the supra-spinous fossa was only slightly high-pitched, and in front was resonant as far down as the upper border of the third rib. Above the left clavicle the respiration was diffused-blowing, with a fine crepitation; elsewhere at the upper part of that lung the breath-sound was quite concealed by loud subcrepitant rhonchus. In other respects the physical signs were the same as at the last report, with the exception that the rhonchus at the left back had a more distinctly bubbling character, and was more metallic in quality than before. Since December 27 the temperature had been very high, being seldom less than 105° in the evening, with a fall to 102° or 103° in the morning; pulse 140 to 145; respiration 60 to 84, slower in the morning than the evening.

On January 3 the signs of consolidation of the right apex were still more marked. The dulness reached in front as far downwards as the second rib, and the breathing there was bronchial, with coarse subcrepitant rhonchus. The same rhonchus was heard all over the right back, although the percussion-note was only dull at the apex and the extreme base. At the left back the dulness reached no higher than the spine of the scapula, and the supra-spinous fossa was quite resonant. In other respects the physical signs had undergone little alteration. Vocal fremitus was felt equally on both sides

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posteriorly. The coarse subcrepitant rhonchus was also heard over both sides of the back, at the left base had developed into a large metallic bubbling. The temperature continued very high as a rule, but on the evening of January 1, after very profuse perspiration, it fell to 97.8° in the rectum; by the next morning it had, however, returned to 104°. The cheeks continued flushed in the latter part of the day, and the nares acted slightly, but there were no signs of dyspnœa, although the number of respirations varied from 50 to 60 in the minute. The child's appetite was poor, and he was very thirsty, but he only coughed occasionally, and then sometimes expectorated offensive purulent matter. His breath had also somewhat of a putrid odor.

On January 7 there was great improvement. The temperature since last report had fallen, being seldom over 100°; and his respirations were also much diminished in frequency—40 to 48. On the previous evening, at 7 p. m., temperature 99°; pulse 96; respirations 42. The fetor of breath and sputa had been removed by the use of creasote inhalation. The physical signs had also undergone a favorable change. At the right back the percussion-note was now healthy, but the respiration was rather bronchial, with the same rhonchus becoming rather metallic at the base. Vocal resonance was rather stronger than natural. At the left back the percussion-note was only completely dull from the angle of the scapula to the base. A loud metallic subscrepitant rhonchus accompanied the respiration. This, although coarse, was less large and less like gurgling than before, and at the base was mixed up with a dry, creaking rhonchus. The vocal resonance was still intensely bronchophonic over the lower half of the left back. The metallic subcrepitant rhonchus was heard all over the left front and side of chest, but only slightly at the right front, and the percussion at the right apex anteriorly was merely high-pitched, and no longer dull as before.

The child now began to improve. His temperature remained low, and the pulse and respiration diminished in frequency. His appetite also improved; he looked brighter in the face; was more cheerful and lively, and began to gain flesh. He had occasional attacks of diarrhœa, which rather depressed him at times, but these, after lasting a day or two, subsided readily under the influence of treatment.

The physical signs also improved very greatly. On January 17, at the left back the percussion-note, although generally high-pitched, was only dull at the base, where the respiration was rather blowing, and was accompanied by a faint, fine rhonchus. At the right side, posteriorly, resonance was natural and the respiration was healthy, except at the base, where it became faintly blowing in quality. Vocal fremitus was stronger on the left side than on the right. In front, the physical signs were natural, except that at the left side the breath-sounds were high-pitched and harsh, with here and there a little creaking rhonchus, and in the infra-axillary region some metallic crepitation. Last evening temperature 99°, pulse 84, respirations 29; this morning, temperature 98.4°. On this date (January 17) the bowels became again relaxed, and for several days afterwards the motions although not very frequent, were slimy and unhealthy-looking.

After this the improvement in the general health still continued, and the temperature remained little higher than natural—99° to 100°; the respirations were seldom under 50, and the pulse varied from 100 to 120. The left side continued to move less freely than the right, and the left intercostal spaces sank in more deeply in respiration. This state of things continued until February 5, the physical signs undergoing little change, except that the crepitating rhonchus reappeared on both sides, and became again very metallic at the left base behind.

On February 5 the temperature rose in the evening to 101°, and the pulse and respiration again increased in frequency. From this date the temperature remained high until the end. The severity of the general symptoms also returned, the appetite failed: the strength became reduced; and the boy began again to lose flesh. The physical signs also began slowly to increase. The dulness crept higher up in the left back, the breathing became more generally tubular, the bronchophonic resonance of the voice was no longer limited to the base, and the rhonchus was everywhere on both sides of the fine bubbling variety, with more or less of a metallic quality.

On February 14 the dulness reached at the left back as high as the spine of the scapula; and at the right back the percussion-note seemed less resonant than before, with greater resistance. All over both sides posteriorly bubbling the child suffered soon after his admission into the hospital. The history pointed to some chronic lung-mischief of considerable standing, for the boy had been subject for three years to a frequent cough, and this for two years had been very troublesome, and had been accompanied by the expectoration of purulent matter streaked occasionally with blood. A chronic bronchitis of such duration would probably lead to some increase in the fibrous tissue of the lungs, and to some dilatation of the bronchi. The insignificant character of the physical signs on the child's admission, and the abscence of blowing or cavernous breathing—a change in the respiratory sounds which became afterwards very marked—seemed, however to show that fibroid thickening, if present, was of small extent, and that the bronchiectasis was inconsiderable in amount; but it is possible that the degree to which the disease had advanced may have been concealed by the presence of compensating emphysema. The quality of the percussion-note was found, on the boy's admission, to be altered from a state of health; and the clubbing of the finger-ends indicated some long-standing impediment to the circulation, such as would be produced by a difficulty in the passage of the blood through the lungs. Besides, the rapid extension of the physical signs of consolidation to the front of the chest during the first attack of pneumonia—a phenomenon very unusual in an ordinary case of pulmonary inflammation—seemed to indicate a very abnormal condition of the lung.

At the time when I first saw the patient (December 27) the case presented many points of resemblance to one of pleurisy. The left side of the chest was completely dull over its lower half, both before and behind, and the breathing there was loud and intensely tubular, with bronchophonic resonance of the voice—a condition often to be met with in the pleurisy of childhood. The heart, however, was not displaced; the dulness was not the dead, toneless dulness produced by a collection of fluid; vocal fremitus was not suppressed; and the subcrepitant rhonchus heard with the breath-sound differed widely from the superficial crackle heard in an inflamed pleura, and became finer and more like true crepitus at the base, where it was mixed up with sibilant rhonchus.

After admission into the hospital, the child suffered from two distinct attacks of catarrhal pneumonia. In the first attack the physical signs were those common to the subacute form of that complaint; but in the second a certain abnormal character was imparted to them on account of the extensive dilatation of the bronchi, which at this period had become decided. It was on this account that the crepitation, which was at first of the coarse variety common to that form of pneumonia, became much more bubbling, and acquired an intense metallic ring, such as is often found in small cavities and softening caseous deposits. From the physical signs alone it would, no doubt, have been impossible to exclude breaking up of the lung, especially as the increasing weakness of the child, and his steady pyrexia, were quite compatible with such a condition. The frequency, however, with which severe catarrhal pneumonia is accompanied by dilatation of the bronchi, made it equally probable that bronchiectasis was the cause of this peculiarity in the auscultatory signs; and the post-mortem appearances confirmed this view of the case.

Besides the catarrhal pneumonia and the dilated bronchi, the autopsy showed a considerable excess of fibroid tissue in both lungs. The fibroid induration was as yet in an early stage. Had the boy recovered from the second attack of pulmonary inflammation, the bronchiectasis would no doubt partially subside, and a certain wooden quality of percussion-note, with harsh or bronchial breathing, might have been the only physical signs remaining to indicate the abnormal condition of the lung. In fact, possibly little more would have been discoverable than was present when the child was first admitted into the hospital.

During an early stage of the disease the symptoms are very slight, and the physical signs are those which have just been enumerated. If the lesion extends over a considerable portion of the lung, the percussion-note is slightly high-pitched, with a certain wooden quality ; resistance is rather increased ; vocal fremitus presents nothing characteristic, for, if sometimes stronger, it is sometimes weaker than natural ; the breathing is harsh or bronchial ; and the vocal resonance, unless there be dilatation of the bronchi, is generally normal. If there be accompanying catarrh, some coarse bubbling or crepitating rhonchus may be heard at various parts of the chest. The patient is sensitive to cold, and prone to catarrhs and attacks of catarrhal pneumonia, but between such attacks the expansion of the side may be fair and the general health leave little to be desired.

When the induration is limited to the base of the lung, as it is sometimes found to be, as a consequence of an attack of pleurisy, there is dulness at the extreme base behind, with excessively weak bronchial breathing, and often coarse liquid rales. A case of this kind has already been related in a previous chapter.

As the induration of the lung increases and the fibroid tissue comes to be in great excess, the lung is reduced in bulk, the bronchi become dilated, and more or less contraction of the side is the result. The physical signs are then the following :—The wall of the chest immediately over the diseased part is flattened, and the respiratory movement is hampered, or, if the disease be extensive, even suppressed. The contraction of the lung draws in the soft parts in its neighborhood, so that the mediastinum is drawn towards the diseased side. As a consequence of this, the opposite lung is found to project across the middle line of the sternum, and the heart is usually displaced. If the induration affect the upper part of the left lung, the heart is drawn upwards ; if the right lung be the one diseased, the heart is drawn towards the right side, and in extreme cases may be felt beating to the right of the sternum. In cases, however, where the pericardium has become adherent to the left pleura this displacement is prevented. On account of the contraction of the chest-wall, the circumference of the thorax at the part affected is reduced. Vocal vibration is sometimes increased, but more frequently it is diminished, and is often hardly perceptible. The percussion-note is dull, with wooden or tubular quality, and resistance is usually, but not always, increased. The respiration differs in character according to the quantity of secretion in the tubes ; if the tubes are nearly empty, it is of the blowing variety, either tubular or cavernous, and is generally very loud ; vocal resonance is, as a rule, bronchophonic, and there is much clicking rhonchus mixed up with creaking sounds. If, however, there be great accumulation of secretion, the breath-sound is weak and bronchial, with but little rhonchus, and faint vocal resonance. The signs are in most cases limited to one side of the chest, as both lungs are rarely affected. Of the symptoms, the most characteristic is the violent paroxysmal cough, occurring at rare intervals and ending in retching efforts, and the expectoration of enormous quantities of offensive purulent matter. The fetor of the sputum is due to its retention in the tubes, on account of the loss of elasticity of the bronchi. The difficulty with which it is brought up is owing to the same cause, and in bad cases its expulsion is only effected by violent contractions of the diaphragm. The respiration is habitually rather hurried, and ranges from 30 to 40 in the minute. Hæmoptysis is rare, but is sometimes seen in older children. There is sometimes a tendency to diarrhœa ; and in bad cases, towards the end of the disease, ulceration of the bowels may take place.

Unless the expectoration be very copious, or the diarrhœa troublesome, the general nutrition of the child is often good, for where the disease is not far advanced, emaciation is certainly not necessarily produced by such a condition of the lung. There is in many cases a considerable amount of plumpness, and the complexion is often healthy. When nutrition suffers, it is chiefly as a consequence of the catarrhal attacks to which these patients are so subject ; but at the end of such attacks the temperature, which had been elevated, sinks to a natural level, the strength usually returns, and the child regains flesh and color.

So long as it remains uncomplicated, fibroid induration of the lung does not give rise to pyrexia. If the temperature in any case is found to be high, the elevation is due, in the majority of instances, to the presence of catarrhal pneumonia, which is so frequent an accompaniment of the disease. Ulceration of the bronchial tubes will also cause the temperature to rise. In these cases the cause of the febrile symptoms may be discovered by a microscopical examination of the sputum. The expectoration must be boiled in a test-tube, with an equal quantity of caustic soda, and after a short time the mixture will be found to be converted into a perfectly transparent fluid. If any fragments of elastic tissue be present, they will sink to the bottom of the tube, whence they can be easily removed by a pipette, and placed under the microscope. Such fragments, if areolar, are conclusive evidence of ulcerative excavation.

The indurated lung offers a certain impediment to the pulmonary circula- Consequently, if the disease be at all extensive, there is some enlarge-

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ment of the right side of the heart, and the aortic venous system is fuller than natural; so that the veins of the neck and chest, and often of the limbs, are unusually prominent. The fingers soon become clubbed. If any catarrh be superadded, the patients often present something of the congested, turgid appearance of the face which is seen in old emphysematous subjects.

In adults, a late stage of the disease is often accompanied by a certain amount of œdema of the extremities. This may, probably, be also true of children. In the only two cases, however, of fibroid induration complicated by œdema, which have come under my notice, the patients were the subjects of extensive amyloid degeneration of organs—a condition which would itself account for the serous effusion.

In the following case the induration of the lung is seen to have advanced to the stage of contraction. It presents a condition which is not uncommon in children as a consequence of pneumonia:—

### CASE XXIX.—FIBROID INDURATION OF APEX OF LUNG WITH CONTRACTION OF CHEST.

Alice P., aged fourteen, was admitted into the East London Children's Hospital on March 24. Her illness had begun three years before with shivering, followed by fever and cough, and the girl kept her bed for a fortnight. Since that time the cough had continued, and she had slowly lost flesh. Last Christmas she became worse: her cough was more troublesome, she lost her flesh faster, and often complained of feeling cold, and of pains in the left side of her chest.

STATE ON ADMISSION.—The girl is rather thin, but does not look ill. She has some color in her cheeks; appetite pretty good. She coughs a great deal, and expectorates thick greenish-yellow matter, but the sputa are not offensive, and there is no fetor of the breath. She states that some weeks ago the expectoration was much more profuse, and was rather offensive. It was brought up with retching efforts after prolonged fits of coughing. Temperature at 5 P.M., 99.8°. The left side of chest is flattened at the upper part, and is unnaturally hollow below the nipple. Respiratory movement very deficient on that side. Heart's apex half an inch below the nipple, and slightly to the inner side. The percussion note is dull from above the clavicle to the third interspace. Just below the clavicle the note is rather tubular. Vocal fremitus is felt faintly above the clavicle, but is only just perceptible below over the dull area, and is very much weaker than on the opposite side. The respiration over the same area is cavernous, and is accompanied by a little metallic bubbling rhonchus and creaking sounds. At the base the breath-sound is excessively weak, and the same creaking and bubbling sounds are heard. The vocal resonance is bronchophonic. At the left back there is only dulness at the supraspinous fossa, but the respiration from apex to base is bronchial and very feeble, with the same rhonchi as in front. Vocal vibration is faint, and vocal resonance is stronger than natural. In the axillary and infra-axillary regions percussion is natural. Respiration towards the armpit is blowing: below it is merely weak and harsh. On the right side the chest is naturally resonant, both before and behind; respiration is everywhere rather wheezing, with prolonged expiration; and a little bubbling rhonchus, not metallic in character, is heard here and there. There is no creaking, such as is heard on the left side.

While in the hospital the girl improved considerably in general health, although during her stay she had an attack of pneumonia affecting the middle lobe of the right lung. This, however, passed off without producing any permanent injury, for the removal of the deposit appeared to be complete, although the percussion-note did not become perfectly resonant at the right scapular region until nearly three weeks after the beginning of the attack. The usual temperature, before the attack of pneumonia, was normal; afterwards it remained a little higher than natural (99.6° to 100°). The pulse was, as a rule, just over 100; and the respirations varied from 30 to 38.

On April 26, shortly after the girl left the hospital, the physical signs were exactly the same as on her admission, and the bubbling and creaking rhonchus still persisted. Her general health had, however, greatly improved. She looked well, and had gained considerably in flesh.

Another illustration of the same condition is seen in the following case:—

### CASE XXX.—FIBROID INDURATION OF THE APEX OF THE LUNG WITH CONTRACTION OF THE CHEST.

Clara S., aged seven, was admitted into the East London Children's Hospifrom the clavicle as far as the level of the nipple, and behind at the supraspinous fossa. In the axillary region there is tolerably good resonance as far as the level of the nipple. The resistance is nowhere much increased. Respiration is everywhere cavernous on the right side, with metallic bubbling rhonchus, and the vocal resonance is bronchophonic. The left side of the chest is rather hyper-resonant, with loud, harsh breathing, and the resonance passes across the sternum to the right side, about the distance of one finger's breadth beyond the middle line. At the left back the respiration has rather a hollow quality, which appears to be conducted from the opposite side.

The child remained several months in the hospital, but without much alteration in her condition. The œdema varied in amount, and the physical signs underwent only slight changes, which appeared to be dependent upon the varying amount of purulent secretion in the tubes. Thus, if no expectoration had taken place for several hours, the respiration at the right base would be merely faint and bronchial, with vocal resonance weak or annulled. If now the child had a paroxysm of coughing, and brought up a large quantity of sputa, the respiration at once became loud and cavernous, and the vocal resonance became bronchophonic. The temperance was seldom materially elevated, and ranged usually from 99° in the morning to 100° in the evening; the pulse varied from 115 to 125, and the respirations from 38 to 48.

In this case there were evident signs of contraction of the right lung. The diameter of the chest was very much diminished on that side; the spine was curved, with the concavity to the right; and the mediastinum was drawn in the same direction, as was shown by the resonance of the left lung passing across the middle line of the sternum. The heart, however, was not displaced, owing, no doubt, to the existence of adhesions between the pericardium and left pleura. The falling of the shoulder, and lowering of the nipple on the right side, with the curvature of the spine, might have suggested pleurisy with retraction; but there were many symptoms which pointed to a different conclusion. The contraction was not limited to the lower part of the chest, as in pleurisy, but was general over the whole side, and was indeed especially well marked above. On listening to the chest, loud cavernous breathing with bronchophonic resonance of the voice, was everywhere audible, and the large bubbling rhonchus, which accompanied the breath-sound, furnished by itself a strong presumption of the presence of bronchiectasis. Again, the offensive character of the sputa was very characteristic of bronchial dilatation, and the method in which this was expectorated—viz., at rare intervals, after a paroxysm of violent cough, ending in retching efforts—was a symptom very significant of fibroid induration of the lung, with great rigidity of the tubes.

The lung affection was not, however, the only disease from which the child was suffering. The size and firmness of the liver and spleen, the enlargement of the lymphatic glands in many situations, the albuminuria, and the marked anæmia, indicated the existence of amyloid degeneration. To this constitutional disease the emaciation, which was a prominent feature in the case, must no doubt be attributed, for in children fibroid induration of the lung is not necessarily accompanied by any loss of flesh. There was no history of syphilis, and the duration of hepatic and splenic enlargement, as it had been unnoticed by the parents, could not be ascertained; but no mention of any such disease occurs in the short note which Dr. Baumler kindly supplied me, and the absence of albuminuria is especially remarked. The enlargement must, therefore, have occurred subsequently to the child's attendance at the Victoria Park Hospital, in December, 1871. It is probable that the profuse purulent expectoration from which the patient had suffered since that date may have been a determining cause of the disease in these organs. In early life there is a special tendency to amyloid degenerations, for the frequency with which such a result follows any supperative drain upon the system, if the drain be at all prolonged, is a matter of common observation in a children's hospital.

The three preceding cases have been accompanied by falling in of the chest-wall; contraction of the lung is not, however, a necessary consequence of fibroid induration, even where the disease is of considerable standing, as will be seen in the following case:—

### CASE XXXII.—EXTREME FIBROID INDURATION WITHOUT CONTRACTION OF SIDE.

Jacob P., aged five years, was admitted into the East London Children's and the note was tubular at the apex both before and behind. The vocal fremitus continued strong, and the resonance of the voice intensely bronchophonic. The respiration was still amphoric, but less markedly so than before, except at the base in front, where it was very loud. The same metallic gurgling rhonchus accompanied both inspiration and expiration. The condition of the heart was unaltered. The murmur was still heard over the whole of the præcordial region, but faintly at the base, and the apex was one inch and a half below the nipple, and slightly to the outer side of the nipple-line.

On March 17 the dulness was found to be the same, but it was noted that the respiratión had lost its amphoric quality, and had become cavernous all over the right side of the chest. The bubbling rhonchus was still metallic, but without the musical tone before noticed, and the vocal resonance, although stronger than natural, was not bronchophonic. The vocal vibration still remained more marked than on the opposite side. The temperature was usually 99°, occasionally rising in the evening to 100°. Pulse generally 120; respirations 30 to 40.

On March 24 there were signs of clearing at the right apex. The percussion-note, although high-pitched, was tolerably resonant at the supra-spinous and supra-clavicular regions, and the respiration there was merely bronchial. The whole right back, indeed, was less dull than before, but the respiration was still cavernous, with the same metallic bubbling rhonchus. Over the front of the chest the percussion-note was dull below the clavicle, but resistance was almost natural. Respiration weak, and almost covered by the bubbling rhonchus. Vocal resonance was natural, except at base, where it was increased. In the axilla percussion was resonant, with slight tubular quality; in the infra-axillary region it was still dull, with cavernous breathing.

After this date the physical signs gradually improved, and on April 10 the dulness was limited to the base, both before and behind, although over the whole side the percussion-note remained more or less high-pitched. At the base the respiration was still cavernous, with crisp, large-sized bubbling rhonchus and increased vocal resonance. Elsewhere the breathing was bronchial, with the same rhonchus. Over the dull area the vocal fremitus was stronger than natural. The boy was now looking very well, and he coughed but little. His spine was quite straight, and the shoulders and angle of the scapulæ were on the same level. His chest measured on the right side ten inches and seven-eighths, and on the left eleven inches and three-eighths, one inch below the level of the nipple. His usual temperature was now 99° to 100°, pulse 108 to 120, respirations 34 to 40. He left the hospital on April 10.

On October 20 the boy was again admitted with a return of his symptoms. On this occasion there was noticed to be a little depression of the right shoulder, and the spine was very slightly curved, with concavity to the right. The circumference of the chest was now equal on the two sides. At the level of the ensiform cartilage each side measured eleven inches and three-quarters. Enlargement of the liver was now noticed for the first time; the edge could be felt three fingers' breadth below the false ribs. The boy was fat and sturdy-looking. The ends of fingers markedly clubbed. His cough was violent, and often ended in retching, during which he expectorated large quantities of thin, offensive, purulent sputa. The breath was very offensive, with the same putrescent odor as the expectoration. The physical signs were much the same as before. There was dulness at the lower half of the right side of the chest, both before and behind, bnt vocal fremitus was excessively faint over the dull area, although distinct elsewhere. Respiration was loud and cavernous, and was accompanied by large metallic bubbling rhonchus, and dry creaking sounds. Vocal resonance was intensely bronchophonic. Over the upper part of the chest respiration was faintly bronchial, with non-metallic bubbling rhonchus. All over the left side of the chest respiration was loud and coarse, and was accompanied by faint and distinct metallic bubbling rhonchus—conducted, probably, from the diseased side. There was little movement of the right side during inspiration. Heart's apex an inch and a quarter below left nipple, and half an inch to inner side. Soft systolic murmur heard as before at apex; heard also at angle of left scapula, and, faintly, at base of heart. Temperature, 7 p. m., 100.8°.

During the boy's stay in the hospital on this second occasion his temperature was habitually over 100° both morning and evening, and his respirations valung itself was extensively indurated. The upper lobe still crepitated slightly on pressure, but the two lower lobes were very dense and solid. On section of the lung white thick bands of fibroid tissue were seen radiating from the root of the lung towards the circumference. The bands were separated by purplish hollows or cavities, which on close examination were seen in each case to be continuous in the direct line with bronchial tubes. They were for the most part perfectly smooth in the interior, and were evidently dilatations of the bronchi. Here and there, however, some ulcerations in the walls were discovered, and one or two of the cavities appeared to be the result of ulcerative destruction of tissue. The larger bronchi were very much thickened as well as dilated. In the case of the smaller air-tubes the walls were not especially thickened, but the tissue between them was very dense, and appeared to consist of fibroid tissue interspersed with emphysematous air-cells. This dense tissue was honey-combed in all directions by the dilated bronchi, which ended in spacious *culs-de-sac* almost immediately under the pleura. The left lung was extensively emphysematous, and presented large patches of collapsed tissue. It was the seat of bronchitis, otherwise its structure appeared to be unaltered. No cheesy deposits were found in either lung, nor were there any grey granulations either there or in any other organ. The liver was enlarged, reaching to the level of umbilicus; its substance was dense, its edge firm and sharp, and its section was stained by a watery solution of iodine, showing the presence of amyloid degeneration. The spleen was slightly enlarged, and had a waxy look.

This boy had suffered for three years and a half from cough, with the expectoration of yellow phlegm. The attack, however, for which he was first admitted into the hospital had begun only a week before, with pain in the side. On examination there was found to be general dulness on percussion over the right half of the chest, both before and behind. As has been often before remarked in the course of these pages, dulness coming on suddenly, and occupying the front as well as the back of the chest, is due, in the large majority of cases, to pleurisy with effusion ; but, in the present instance, the other physical signs failed to support this view. The loud cavernous breathing and bronchophony were indeed, in a child, quite compatible with the existence of even a large effusion, but the presence of vocal fremitus, which was throughout stronger on the diseased than on the opposite side ; the character of the percussion note, which was not completely toneless, and was not accompanied by much increase of resistance ; the non-displacement of the heart, and the shape of the chest, which, as drawn by the cyrtometer, had not the square outline which it invariably assumes when the fluid is at all considerable in amount,—seemed to imply that if pleurisy were present, it was accompanied by little effusion, and that the dulness must therefore be principally due to another cause. Besides, the abundant fine bubbling rhonchus heard all over the affected side of the chest was evidently intra-pulmonary, and was very different in character from the superficial pseudo-crepitation of an inflamed pleura.

The physical signs, therefore, taken altogether, pointed to consolidation of the lung, and tended directly to disprove the theory of liquid effusion. The next question, then, was to determine the nature of the consolidation. The history showed the existence of a lung affection dating from an attack of pertussis three years and a half before. Superadded to this was some recent acute attack, which was accompanied by a considerable elevation of temperature. The cavernous breathing, large metallic gurgling, and bronchophony indicated the presence of cavities in the lung ; but were these cavities the result of breaking down of lung-tissue, or were they merely dilatations of the bronchi ? The well-nourished state of the patient seemed to imply that excavation so extensive could not in this case be the consequence of ulcerative destruction of lung, for so serious a lesion must necessarily have been attended by a very considerable degree of emaciation. Besides, there was no evidence of deposits in the apex of the opposite lung. The signs in question must therefore have resulted from the presence of dilatations in the bronchi. Bronchiectasis may be either an acute or a chronic condition. It is acutely produced in many cases of catarrhal pneumonia, more especially in those where the disease assumes a subacute form. The dilatations are seldom noticed until the disease has lasted two or three weeks ; and after the subsidence of the inflammatory attack the air-tubes may gradually resume their normal calibre. Sometimes, however, and usually in cases where the lung has been the seat of repeated

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attacks of catarrhal pneumonia, the bronchi become permanently dilated.—There is then always considerable thickening of the air-tubes, and the fibrous tissue of the lungs is in great excess. Such cases are, in fact, cases of fibroid induration of the lung. In the present instance the disease had lasted too short a time to give rise to acute bronchiectasis ; and therefore we must conclude that the right lung had suffered from several attacks of catarrhal pneumonia, which had led to fibroid induration of the lung-tissue and permanent dilatation of the bronchi. The present was evidently a similar attack, and during its progress further dilatation of the air-tubes appears to have taken place ; for the respiration, which at first had been cavernous, became completely amphoric, and the bubbling rhonchus assumed an almost musical tone, approaching somewhat to the tinkling sounds generated in a case of pneumothorax. This extreme dilatation was, however, only temporary. As the inflammation subsided, the bronchi contracted again to a certain extent, except at the base of the chest, where cavernous breathing appeared to be a constant phenomenon.

When the child left the hospital on April 10 there was no contraction of the side; but on his readmission, after an interval of six months, this was noticed to a very slight extent. The physical signs on his second visit were little altered, with the exception that the dulness was perhaps more extensive at the right base than was noted at the last report before his discharge, and that the vocal vibration of the chest-wall, which before had been strong, could now scarcely be detected. The disappearance of vocal fremitus over the seat of dulness is not an uncommon feature in fibroid induration, and is, indeed, the rule in cases where the disease is extensive. Sometimes, however, vibration of the chest-wall appears to vary according to the amount of fluid retained in the tubes. Where this is large, vibration is suppressed, but when the air-tubes have been recently emptied, the fremitus becomes more perceptible. There was in this boy very little contraction of the chest-wall. This may be, no doubt, accounted for by the great dilatation of the bronchi; for when the amount of bronchiectasis is sufficient to compensate for the loss of space by contraction of the lung, the chest-wall is prevented from falling in. The lung itself, however, was much diminished in size, as was shown by the resonance of the left lung passing across the middle line of the chest in front, and reaching, indeed, as far as half an inch to the right of the edge of the sternum. The pyrexia, which continued all through the child's second residence at the hospital, was symptomatic of a certain amount of subacute catarrhal pneumonia, kept up probably by the continued presence in the air-tubes of putrescent pus, which acted as a source of constant irritation.

Shortly before his final admission to the hospital the child caught a further cold and had a severe attack of bronchitis, under which he quickly died. Post-mortem examination showed, as was expected, a very marked degree of fibroid induration of the lung, with extreme and extensive bronchiectasis.

In the following case extensive fibroid induration was combined with a large excavation of the lung:—

### CASE XXXIII.—FIBROID INDURATION WITH EXTENSIVE EXCAVATION OF LUNG.

William W., aged twelve, was admitted into the East London Children's Hospital on March 25. The boy had been fat and healthy up to the age of two years. He then caught a severe cold and began to lose flesh. The cough continued for some time afterwards. He had hooping cough when three years old, and measles at the age of five. Since that time he had been troubled with a frequent cough and often expectorated phlegm. His breathing also since the attack of measles had been habitually short. For five months before admission his urine had been noticed to be purulent, but for several months previously he had cried with pain whenever he passed water.

STATE ON ADMISSION.—Patient a very thin boy; superficial veins very full and prominent along sides of neck and arms, and a network of veins seen on right side of chest close to sternum. The veins of neck swell up very much when boy coughs. Lymphatic glands, particularly those under the jaw, enlarged and hard, but not tender. Some flattening under right clavicle; right shoulder not lower than left. Heart's apex in normal situation, but the impulse is also plainly seen in the epigastrium and in the second and third interspaces immediately to right of sternum. Very little movement of either side of chest during inspiration. Abdomen is full, and liver reaches to level of umbilicus. Edge of spleen cannot be felt, but there is an abnormal sense of resistance below false ribs on left side. There is no œdema of the limbs. The percussion-note is wooden over the right front from above clavicle to nipple level, and at back from the apex to the angle of scapula. At the base both before and behind the percussion-note is comparatively dull. Vocal fremitus is stronger at the right than the left side. Respiration is cavernous above, loud and blowing below, and over the dull area at the base is very weak and blowing. Vocal resonance is everywhere bronchophonic, and at the base can be heard as a faint distant echo. With the exception of some dulness at the extreme base resonance is normal at the left back, but respiration all over the left side is loud and coarse, and is rather hollow at the left edge of the sternum.

The boy passes water tolerably freely: the urine is alkaline, sp. gr. 1010, and contains abundance of pus. There is some tenderness on pressure over the pubes, and the boy complains of pain in the region of the bladder immediately before micturition.

For some days after admission the temperature was about 100° at night, but fell in the morning to the natural level. The pulse was slightly over 100, and the respiration 30 to 36. On April 5 the temperature rose in the evening to 101.4°, and was 100° on the following morning. During this time much coarse crackling rhonchus was noticed over the whole of the right side both back and front, except the posterior base, and a soft systolic murmur was noted to the right of the sternum over the seat of visible impulse.

From this time the boy became gradually weaker and thinner. His temperature varied, sometimes rising as high as 104° in the evening, and seldom falling lower than 101.8° after 6 p.m. In the morning it stood usually at 100°. On May 2 some ringing metallic bubbles were heard with respiration on the right side, mixed with cracking sounds. The urine remained loaded with pus. On May 20 the temperature fell to 98.6° in the evening, and remained low till May 27, when the boy died. At 8 a.m. on the morning of his death the temperature was 97°.

During his residence in the hospital the patient complained frequently of digestive disturbance. The bowels were often relaxed, and the tongue was always red and glazed, looking as if entirely denuded of epithelium. On admission his weight was 3 st. 4 oz. By April 12 he had gained 4 oz., but soon afterwards he began to lose flesh, and on May 18, when his weight was taken for the last time, it was only 2 st. 9lbs. 3 1-2 oz.

The physical signs remained unaltered throughout, except for variation in the amount of rhonchus which was heard with the breath-sounds. This at times would be copious, very metallic and ringing, at other times scanty, and mixed up with creaking sounds. His breathing, although rather hurried, was not distressingly so, and he never complained of dyspnœa. He expectorated a good deal of purulent matter at times, and the cough was sometimes very violent.

On examination of the body the liver was found to be very large, weighing 4 3-4 lbs. The spleen weighing 5 1-2 oz., and the kidneys 5 1-4 oz. each. All those organs were undergoing amyloid degeneration, and their sections were deeply stained with iodine. The right kidney was the seat of old pyelitis; the walls of the pelvis were very thick. In the substance of the organ was an abscess with thickened walls communicating with the upper part of the pelvis. Both ureters were dilated and hypertrophied. The walls of the right were 1-6 inch in thickness. The bladder was much contracted with thickened walls: the mucous membrane was granular and felt very dense. No ridges of muscular fibre were seen as in cases of hypertrophy from stricture of the urethra.

The right lung was found to be forced upwards and backwards against the spine, so that the upper surface of the diaphragm reached as high as the third rib. The lung was everywhere adherent, and was much torn in removal. On section its substance was excessively hard, creaking under the knife; the walls of the bronchi were thick and rigid, and throughout, the fibroid tissue of the lung was in such great excess that very little air-containing tissue appeared to be left. A large cavity was found occupying the antero-lateral part of the lung, and extending nearly from apex to base: many large bronchi opened into it. There was a small collection of purulent matter at the base of the lung between the opposed surfaces of the pleura. The left lung was emphysematous at the upper part with some collapse at the posterior base. On pressure some small nodular masses were felt in the interior, and on sec-

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tion the upper lobe and part of the lower were found to contain numerous small cheesy masses. In the upper part of the lower lobe, at its posterior surface, was a cavity the size of a filbert filled with thick purulent matter. The heart lay in its natural position, being kept in place by adhesions between the pericardium and pleura. The right ventricle was somewhat thickened. The pulsation noticed during life to the right of the sternum was produced by the contraction of the right auricle.

There can be little doubt that in this case the origin of the disease was an attack of pleurisy on the right side of the chest. The lung had been apparently exposed for a considerable time to severe pressure from effused fluid, and had not afterwards expanded. The fluid had been gradually absorbed, except a small quantity, which was still left separating the layers of the pleura at the base: elsewhere the opposed surfaces had formed firm adhesions. Except a certain amount of flattening under the clavicle there was little contraction of the right side of the chest, for the drawing upwards of the liver and diaphragm prevented the wall from falling in.

The fibroid induration of the lung took place, no doubt, as a consequence of the pleurisy, the fibroid overgrowth beginning at the circumference and spreading thence into the interior, until the greater part of the organ was converted into a fibroid hard mass. The large cavity discovered in the interior of the lung was in all probability a consequence of the fibroid induration. Ulceration of bronchi is not an uncommon result of such a lesion, and may lead, as in this case, to extensive excavation. The comparatively small amount of disease in the left lung seems to support this view, for had the ulcerative destruction of lung preceded the fibroid change, we should have expected much more extensive consolidation on the opposite side of the chest.

The chronic cystitis and pyelitis probably resulted from neglected catarrh, and the profuse purulent discharge to which they gave rise was quite sufficient to determine amyloid degeneration of organs, especially in a young subject. Children, as has been before remarked, have a special tendency to this form of degeneration, and in them a comparatively small amount of suppurative drain is sufficient to excite it.

After the illustrations furnished by the preceding cases, little remains to be added upon the subject of diagnosis. The disease produces consolidation of the lung, combined with contraction of the diseased pulmonary tissue and dilatation of its bronchi. Its distinguishing marks will therefore be the physical signs indicative of those conditions: a falling-in of the chest-wall at the seat of disease, with drawing of the neighboring organs towards the affected part; dulness on percussion, with, usually, diminution in vocal fremitus; loud blowing or cavernous breathing, with metallic crepitation and gurgling, and bronchophonic resonance of the voice;—these signs confined to one side of the chest; the other lung being healthy. Additional evidence is furnished by the character of the special symptoms. The cough is paroxysmal, and ends in the expectoration of large quantities of offensive purulent fluid, sometimes also in retching and sickness. The breath often has an offensive putrid odor. There are signs that the blood passes with difficulty through the lungs: the right ventricle is frequently hypertrophied; the superficial veins of the chest, neck, and often of the arms are unusually visible; and the fingers soon become clubbed.

If the case be first seen during an attack of catarrhal pneumonia, it may be mistaken for one of pleurisy with effusion; if there be much falling-in of the chest-wall, the disease may be confounded with pleurisy in the stage of retraction. The distinguishing marks by means of which the two diseases may be recognized, have already been insisted upon. Of these, the one which may be looked upon as of the chiefest importance in excluding pleurisy is the presence of metallic gurgling rhonchus; for although, in the pleurisy of childhood, cavernous breathing and bronchophony are far from uncommon, the breath-sound is not accompanied by rhonchus, and the crackling friction which is often heard can usually be readily recognized by its superficial character, and is never large and metallic like the sounds produced in a rigid, dilated air-tube. The cavernous character of the breath-sounds may cause the presence of ulcerative destruction of lung to be suspected, but the strict limitation of the disease to one side of the chest, which would not be the case in phthisis, may serve to establish the difference. Besides, the general condition of the patient is here of importance. In fibroid induration of the lung nutrition is usually fair and the strength pretty good, while the third stage of phthisis is seldom unaccompanied by emaciation and great weakness. It must not, however, be forgotten that ulceration of the bronchial tubes may occur as a consequence of the continued irritation induced by the fetid contents of the tubes, and may lead to destruction of lung-tissue and the formation of cavities. In these cases (called "fibroid phthisis," by Dr. Andrew Clark), cavities and dilated bronchi may be present in the same lung. Here, however, the opposite lung seldom escapes, and, if there be much destruction of tissue, general nutrition is seriously impaired. The child wastes and becomes more and more enfeebled; his temperature is high; and he dies with all the symptoms of consumptive disease. In most cases where ulceration of the bronchial tubes is taking place, a careful microscopic examination of the sputum will discover the presence of fragments of elastic tissue.

The prognosis in fibroid induration of the lung in children is not necessarily unfavorable. So long as it remains simple it appears to exercise little influence upon the nutrition and general development of the child. It becomes dangerous only through the accidents which such a condition of lung tends especially to provoke. As such patients are very sensitive to changes of temperature, they are very prone to suffer from attacks of pulmonary catarrh: and on account of the difficulty met with in expelling secretion from the rigid air-tubes, the sputum is apt to be retained and to putrefy. It then gives rise to great irritation, and after a time may excite an attack of catarrhal pneumonia. The seat of the induration is therefore of importance in prognosis, for if the apex of the lung be the part affected, the force of gravity will itself tend to prevent accumulation of secretion in the air-passages, and the changes of retention will be greatly diminished; while in the case of disease, at the base of the lung, all the conditions assist in opposing the escape of the contents of the tubes, and the danger of an attack of catarrhal pneumonia is materially increased. As the irritation of the bronchi is in direct proportion to the degree of putrescence of the expectoration, an offensive smell from the breath or the sputa is a certain sign that the lung is exposed to the risk of inflammation.

Catarrhal pneumonia, when it occurs, generally assumes the subacute, and therefore less severe type, and if the disease be not extensive and the nutrition of the child be good, often ends favorably after a time; but its course is apt to be protracted, for the retained decomposing secretion acts as a constant source of irritation. When the attack of pneumonia is acute and violent, its issue is usually as disastrous as in any other case of this serious disease.

Anything which reduces the strength of the child, such as attacks of diarrhœa, or of vomiting, or of severe hæmoptysis, must be looked upon as an unpromising symptom: for healthy nutrition of the body generally is indispensable to favorable progress. Hæmoptysis is not necessarily a sign that ulceration of the bronchial tubes is taking place; but is often due to this cause, and when it occurs, a careful microscopic examination of the expectoration should be made. If amyloid disease of organs occur, especially if it be accompanied by œdema, the prognosis becomes very serious, but even in these cases death may not take place until after considerable delay. Œdema, although unaccompanied by amyloid change, is itself a dangerous symptom, as it betokens a very impoverished condition of the blood.

The treatment of fibroid induration of the lung consists in doing our best to maintain healthy nutrition, and in preventing, if possible, the accidents to which this state of lung is necessarily prone. On account of the sensitiveness of such patients to changes of temperature, great care should be taken to avoid sudden chills. The child should be warmly dressed, and should never leave the house in damp or cold weather without some special protection for the neck and chest. All catarrhs should receive immediate treatment. The patient should be at once confined to bed, and saline diaphoretics should be administered so as to loosen the cough and relieve the irritation of the air-passages. Afterwards, stimulating expectorants can be employed to assist in the expulsion of the phlegm.

In cases where there is great rigidity of the bronchi, and little power to expectorate, and especially in cases where an offensive smell from the breath indicates that secretion has been retained and is putrefying in the tubes, disinfecting and astringent inhalations should be employed to remove the offensive character of the secretion and prevents its reproduction. Inhalations of m impregnated with carbolic acid or creasote (twenty minims to the pint), may be made use of, and the addition of a teaspoonful of the compound tincture of benzoin, which is a powerful stimulating expectorant, will be found of service. When the amount of secretion is large, it can often be controlled by limiting the quantity of liquid taken by the patient, and by the use of tannin and other astringents in a spray. In these cases, the best medicines are tonic and astringent remedies, such as tinct. ferri perchlor. in large doses, with quinine, and a few drops of liq. morphiæ. Cod-liver oil is also useful. The expulsion of the contents of the tubes is greatly assisted by an occasional emetic. The best emetic in these cases is the one which acts most quickly and produces the least nausea, such as a teaspoonful of mustard in water, or a couple of drachms of powdered alum in syrup. Sulphate of zinc is not to be recommended for children, as its action is very uncertain.

In cases where vomiting takes place after the fits of coughing, great interference with nutrition may be the consequence, for the paroxysms of cough are apt to occur immediately after a meal; and in such a case the greater part of the food may be returned. Now, the vomiting can not be regarded as otherwise than a beneficial act, in that it assists in the expulsion of the injurious secretions. It is only hurtful to nutrition because it takes place at an inconvenient time. In these cases the terminal vomiting may often be controlled by small doses of liq. strychniæ, or by one drop of liq. arsenicalis given with iron und morphia; but as it is undesirable to put an end to the vomiting entirely, this may be encouraged at another time, as in the early morning, by draughts of warm water, preceded, if necessary, by a dose of alum or mustard and water.

Catarrhal pneumonia, when it occurs in these cases, must be treated in the usual way. When there is dropsy, tonic and astringent remedies are especially indicated.

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